A Study of the Value of Urban Tree Improvement in Phnom Penh City of Cambodia, Using the Contingent Valuation Method

Final Report

By

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List of acronyms and appreciations

CDRI	Cambodian Development and Resource Institute
CV	Contingent valuation
CVM	Contingent valuation method
DB	Double-bound
DC	Dichotomous choice
IDRC	Canadian International Research Centre
OE	Open-end
MPP	Municipality of Phnom Penh
PP	Phnom Penh
UTF	Urban tree fund
WTP	Willingness to pay

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Executive Summary

Trees are an essential component of urban infrastructure development. They provide significant contributions to quality of the living environment and human health. Unfortunately, the benefits and their functions in urban areas are largely overlooked, due to the need for investment in planting and maintaining them. This is a particular challenge in the Municipality of Phnom Penh (MPP), which needs a clear development and implementation plan for urban tree development and maintenance. To help address this issue, a study was undertaken to document the view of residents of MPP in relation to urban tree development. The dichotomous choice format of the contingent valuation method was employed to survey and document responses of 384 households in representative areas of MPP. The results of the study are expected to be able to be used to improve urban tree policy and advance the understanding of public perceptions relating to 'willingness-to-pay' (WTP) for changing present conditions relating to urban trees.

The study of urban tree improvement through residential participation revealed that most people have an understanding of the benefits of urban trees and their essential functions in enhancing the quality of the urban environment. Study respondents identified urban trees as an important component in the development strategy for MPP. The current conditions of urban trees is regarded as poor, with a combination of low tree density, lack of protection, inappropriate species, and a lack of proper maintenance. A crafted scenario for quality improvement with citizen participation has the potential to establish a fund of about US$1.1 million, within a 10 year period. The information relevant to urban tree improvement produced in this survey and report is potentially able to provide new ideals for policy makers in MPP.

Specifically, the outcomes from this study suggest the following policy implications: (i) urban tree improvement can be supported by raising funds from residents; (ii) a master plan for urban trees needs to be developed for implementation; realized; (iii) the management plan of urban trees requires inputs from both arts and science disciplines. Therefore, the human resources component for the development and management of an urban tree programme is most important.

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INTRODUCTION

CHAPTER ONE

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1.1 Problem statement and justification for the study

Cambodia is located in Southeast Asia, and is bordered in the north by Lao PDR, in the south by the Gulf of Thailand, in the east by Vietnam, and in the west by Thailand. The total area of the Cambodia is 181,035 km², and it has a population of over 14.4 million (NIS, 2009). The increasing momentum of urbanization has both direct and indirect impacts on a variety of issues and sectors (ESCAP, 2000). The country requires improved initiatives and strategies to enhance the social welfare of its people. The proper management of the urban environment is an essential component of the economic development and poverty reduction in developing countries. Within this context, trees are an important element of the urban environment, as that they contribute to the esthetics and economic values of urban communities, as well as improving the quality of life in the city through the removal of air pollutants.

Herzele (2005) suggested that each city should have its own forests and that this could gain prominence in the current land use debate and even result in producing new and improved 'spatial practices' for shaping the rural and urban interface. In this context, there is a need to incorporate urban forests as an integral and formal component of municipal planning programmes (French, 1983). The UN-World Health Organization recommends that there be at least 9m² of urban green space per capita, to mitigate a number of undesirable environmental effects (Deloya, (1993)—quoted by Thaiutsa *et al.*, 2008). Tyrväinen *et al.* (2005) assert that the main benefits of urban trees and forests in industrialized cities relate to health, aesthetics and recreational benefits. Further, he pointed out the green areas also provide people with sustenance by providing food, fodder, fuelwood and timber for construction. There is clear evidence that urban trees provide many benefits to both social and environmental services, but that these benefits are mainly confined to cities in Europe and a few cities in the Asian region.

Many studies have shown that there are perception problems with urban trees, with the value of trees and plants in urban areas being often overlooked (Wolf, 1998), and receive little attention on political agendas, despite their importance to society in terms of their social, economic, aesthetic, and environmental benefits. This is more particularly the situation in developing countries (Knuth 2005). As a result, urban trees and forests are often destroyed without their public value being assessed (Kwak *et al.*, 2003). Many municipalities have yet to specify their urban forest policies (Tyrväinen and Väänänen, 1998), and many forested areas are considered as 'left over areas' awaiting for more intensive alternative use (Kwak *et al.*, 2003; Löfström, 1998; Tyrväinen and Väänänen, 1998). While, land is increasingly scarce in urban areas, the social demands for urban amenities continue to increase (Choumert and Salanié, 2008).

According to the General Population Census of Cambodia in 2008 (NIS, 2009), the population of Phnom Penh City is over 1.3 million, with a density of 2,696 persons per km². The population living in urban areas of Cambodia is projected to increase to nearly 3 million by 2025 (United Nation, 2007). The annual growth rate of the urban population of Cambodia is probably among the highest in the world (ADB (2003)—cited by Mund *et al.*, 2005). Migration from rural areas is the major cause of urbanization. The majority of population now living in urban areas of Cambodia, have migrated from rural areas (NIS, 2009),

a result of the country opening up and becoming a free market economy, with subsequent high economic growth (CDRI, 2007).

At municipal level, the government set up a city development strategy for the period from 2005 to 2015, but the main focus of this strategy has been on the promotion of economic development and poverty reduction. An urban tree management plan was overlooked, this probably reflecting the early stages of urban development planning and a lack of technical know-how. In addition, the limited annual budget of US$3,500 allocated for this purpose to the Department of Public Transportation, has been able to support relatively few initiatives in the integration of tree planting and gardening, and their related maintenance, in the urban development plan. The objectives of the study summarized in this report was to explore potential opportunities for the integration of urban tree planting and maintenance schemes into the city's master plan, on a basis of citizen participation supporting the practitioners.

1.2 Objectives of the Study

The overall objectives of this study were to evaluate residential perceptions attached to urban tree values, and the level of public participation needed for quality improvement. The specific objectives were: (i) to identify and analyse public perceptions towards urban tree conditions; (ii) to assess residential WTP for improving the quality of urban trees; (iii) the description of demographic and socio-economic characteristics correlated with the public's attitudes and opinions towards urban trees; (iv) assessment of the amount which residents are WTP by using the contingent valuation method (CVM); (v) to determine WTP sensitivity to method of payment vehicles; (vi) to identify the relationship between variables and residents' WTP.

1.3 Significance of the Study

In the MPP, public health and anti-pollution are all parts of overall management by the government. An increasing proportion of the population is living in urban areas with insufficient green space, posing potential problems for both human health and the environment. The trend for increasing urbanization is expected to continue. Unfortunately, policy makers generally lack reliable information on which policy decisions need to be made for

improving the quality improvement of urban environment. In particular, no assessment has been made on the perceptions of residents relating to urban trees and greenery, in situations where the social and environmental demands continue to increase with increased urbanization. Evidence-based research can potentially assist city planners make better decisions and, in turn, result in 'action initiatives'. This study was undertaken to provide information on perceptions relating to public participation in improving the quality of urban trees attached to residences, to provide benchmark information and data of potential value to government development agencies, for policy implications.

1.4 Limitations of the study

Contingent Valuation (CV) is a conventional evaluation approach that has rarely been used for the conduct of surveys in Cambodia. Cambodian people have relatively little experience in the use of this technique when undertaking surveys. In this study, CV was used when asking questions relating to contributions that resident respondents would be prepared to contribute for the implementation of 'urban tree development'. Before answering a question on the amount they would be prepared to pay (in Cambodian Riel per month), most respondents request additional information to help them make a final decision. In some cases, respondents stated that '*urban trees were of no value to them*', or *I don't have land to plant a tree, I don't pay any cost to tree, I will maintain it if tree was planted in front of my house*. The implementers of the survey were limited in how they could respond to such questions.

Due to time constraints, data analysis was limited to the use of logistic regression analysis, in relation to the amounts survey respondents indicated a WTP, together with 'public perceptions towards urban tree conditions'. It is acknowledged that large sample sizes are needed (more than 1,000 households) to minimize potential bias in the conduct of surveys. The sample size used in this study was relatively small on account of financial limitations and due to the need to collect information regarded as personal or private by most respondent residents.

Before commencing the actual field component of the study, advice was sought from relevant academic institutions and local administrative authorities responsible for administration at municipal level. Most recommended that the topic of the research should not be appropriate for study at the level of indivi-

dual residents. The reasons cited for caution related to concerns about the study in relation to its potential effects on government policy, with a potential to cause social conflict, particularly in relation to questions relating to financial contributions for implementation of policy.

Caesalpinia pulcherimia planted along the street borders for flower.

Photo by Cheng Sunhy

CONCEPTUAL FOUNDATION

CHAPTER TWO

Photo by Cheng Sunhy

2.1 What are urban forests and trees?

Urban forestry is defined as the "management of trees in urban areas", with management referring to the 'planning, planting and care of trees'. Trees are considered in the context of individual trees, small groups of trees, large stands, and patches of forests, while urban areas are 'where people live and work' (Costello, 1993, cited by Randrup *et al.* (2005). Nowak (1994) defined 'urban forests' as comprising all trees in urban areas. In addition, urban trees have been recognized as being in two main settings: (i) in spaces used for public activities where their presence enhances the space; (ii) extensions of private gardens, most often along streets in the front of houses (Konijnendik, 2008). Trees contribute to a better quality of the living environment in cities, for example, by improving air quality, and consequently the health of urban residents (Tyrväinen *et al.*, 2005). In other words, urban forests are seen as clearly producing beneficial rather than negative effects. The negative features

of forests are related to their management rather than their existence (Tyrväinen, 2001). One of the main values of urban and peri-urban forests is that they have no market value. Their value is seen in terms of 'non-consumptive use value' and include the benefits derived from making the landscape more pleasant, and in providing clean air in a peaceful and quiet recreational environment (Tyrväinen, 1999). McPherson (1992) studied the costs associated with urban trees and forests (i.e. costs associated with planting, pruning, removal and irrigation) through direct estimation and implied valuation of benefits as environmental externalities. Trees contribute to cooling by shading buildings and cooling surfaces; they also provide evaporative cooling surfaces associated with transpiration and evaporation (Russ, 2002).

In recent times, many scientists have reported that urban areas are warming faster than rural areas, on account of much of the vegetation in urban areas is being replaced with pavements and concrete. On account of this, urban trees potentially offer some of the greatest per tree benefits in reducing the adverse effects of global climate change, because of their secondary effects on urban emissions, due to the urban forest's proximity to numerous emission sources (Nowak, 2000). Urban forests and trees can play a significant role in helping reduce atmospheric carbon dioxide levels (Nowak and Crane, 2001). Akbari (2001) found that the mitigation of urban heat can potentially reduce national energy use by air conditioning by 20 per cent, and save over US$10 billion per year in energy use and the improvement in urban air quality. Further, trees may increase, decrease, or have little effect on energy use, depending on the species and location, climate, and building design (Raymond et al., 1984; Heisler, 1996). In another study by McPherson and Simpson (2003), they reported that existing trees are projected to reduce annual air condition energy use by 2.5 per cent with a wholesale value of US$ 485.8 million, through the impact they will have on energy use for cooling and heating, as a result of their moderating influence of climate.

2.2 Design of contingent valuation

The CVM was employed to estimate the WTP, on the basis of a given hypothetical market scenario, relative to the value of benefits from improving the quality of urban trees which are currently in the MPP. The true value of non-market goods and services from urban trees based on the dichotomous-choice format was solicited from each respondent in the survey undertaken.

Specifically, the CMV was used to elicit consumers' preferences by finding how much consumers would be willing to pay for specified changes in the level of provision of public goods (Yoo *et al.*, 2001). Ahmed and Gotoh (2006) stated that the dichotomous-choice (DC) is the most widely used in CVM studies. Further, Boyle (1990) argued that the unique aspect of DC questions is that respondents are asked if they would pay a fixed sum of money for the items being evaluated. Herriges and Shogren (1994) added that follow-up questions are frequently used to improve the efficiency of DC questionnaire. Further, Cameron and Quiggin (1994) pointed out that in the analysis of data based DC follow-up questions, it is important to be explicit in questions asked relating to WTP. Bohara *et al.* (1998) extended their investigations on the potential of total cost and group information influence on responses to open-ended (OE) and DC formats, result showed that DC values are not affected by cost and group size information, while OE are negatively affected.

Cooper *at al.* (2001) maintained that although double-bound (DB) format for discrete choice CVM has the benefit of higher efficiency in welfare benefits estimates than single-bound discrete choice CVM, it has been subject to criticism due to evidence that some of the responses to the second bid may be inconsistent with the responses to the first bid; Loomis *et al.* (1996) relate that DC format may allow biases unique to the "Yes" or "No" format. However, the DC contingent valuation surveys can be improved by asking each respondent a second DC question, the nature of which depends on the response to the first question; if the response is "Yes", the second bid is some amount greater than the first bid; while if the first response is "No," the second bid is some amount smaller than the first bid (Hanemann *et al.*, 1991).

Within the context of the study reported here, urban tree resources in the MPP are viewed as public goods, for which no market price is charged for their utilization by urban residence, for example in terms of esthetics, pleasure and air quality. Each respondent was asked what she/he would be the value of their WTP, to achieve an improvement of urban tree conditions. The estimated monetary value of the assets was based on the calculation of the average WTP of respondents, multiplied by the total number consumers (Mitchell and Carson, 1989). This approach for the study represented a modified version of that of Treiman and Gartner (2006). On the specific issues of ballot votes, respondents were asked the following questions: "For the establishment of an Urban Tree Fund (UTF) to meet tree planting and maintenance costs, the fund would require a payment by you of _____ Riel per household per month."

METHOD OF STUDY

CHAPTER THREE

Photo by Cheng Sunhy

3.1 Location of the study

MPP is the capital of Cambodia, the center of economics, politics, culture and administration. It is located on the banks of Tonle Sap River, a tributary of the Mekong River (Map 3.1). The typical landscape of PP is categorized into two community categories—urban and suburban areas, the administration of which is divided into eight districts which cover an area of 375 square km. Land use in the MPP area can be classified into four categories—commercial, settlements, industrial, and agricultural. The agricultural zones are mainly located in peri-urban areas, where people rear livestock and cultivate crops to help in income generation. The total area classified as agricultural is approximately 21,000 ha. The climate of the city is monsoonal, characterized by distinct wet and dry seasons. The onset of the wet-season is usually in April, with the period of heaviest rain being from July to September. The dry-season usually commences in November.

STUDY LOCATION MAP

SCALE: 1:110,000

Ruessei Keo

Sen Sok

Toul Kork

Doun Penh

7 Makara

Chamkarmon

Mean Chey

Dangkao

L E G E N D

RIVER

KHAN BOUDARY

LOCATION OF STUDY

Meters

0   1,350   2,700   5,400   8,100   10,800

Map 3.1: Location of the study area.
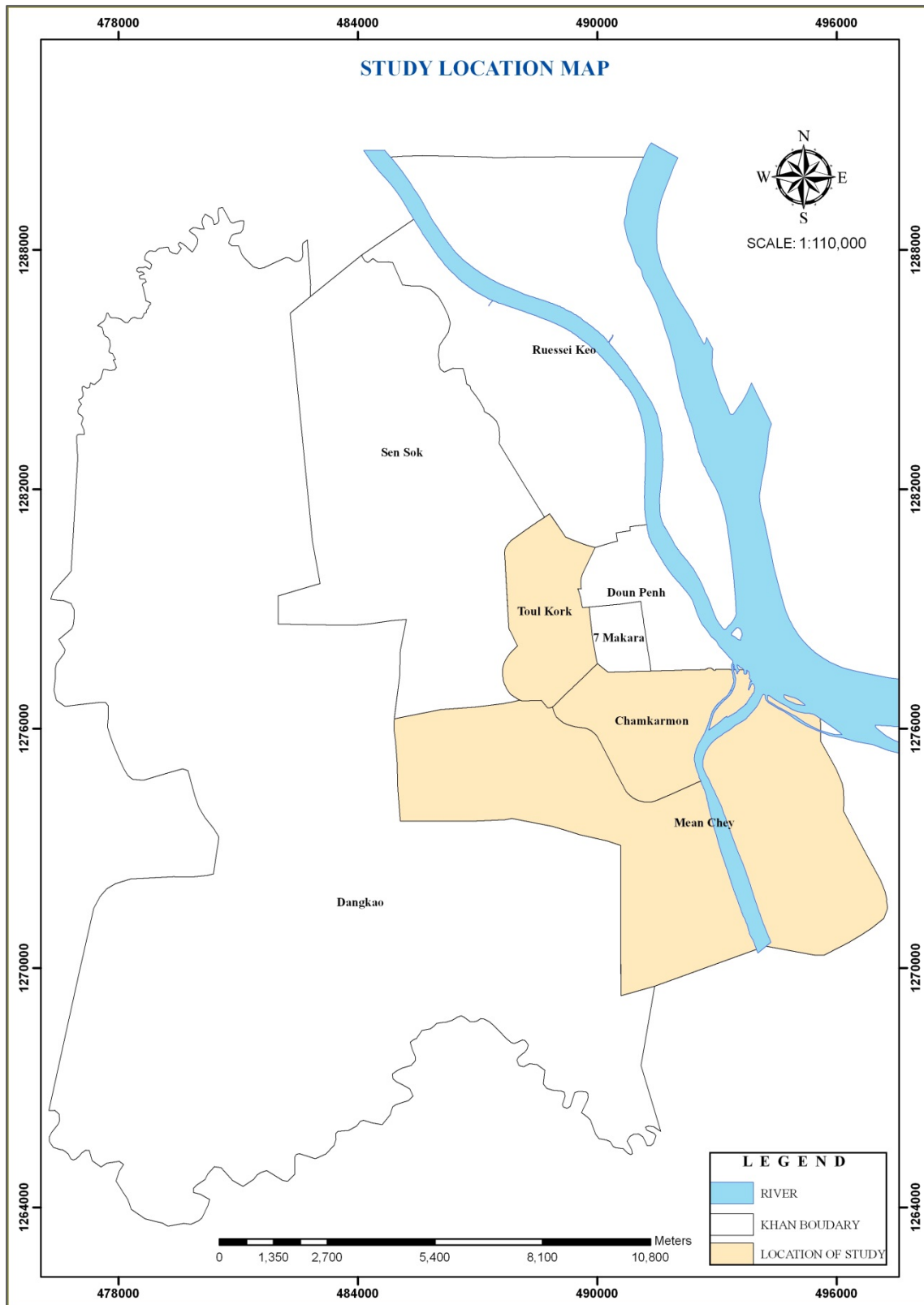
The urban tree resources in MPP can be classified into four categories—(i) trees that border the streets; (ii) gardens; (iii) institutional (in schools, temples, places of work, and the palace); (iv) resident's homes.

A pilot inventory on street trees was conducted by the Department of Public Transportation in October 2009, in Khan Daun Penh, showed that there were more than 25 species being planted and maintained in public areas, with six species being predominant. *Lagerstroemia indica* (In Tanel), *Cassia fistula* (Loeung Reach), *Caesalpinia pulcherimia* (Ka Ngouk), followed by *Hopea odorata* (Koki), *Cassia siamensis* (Ang Kanh), and *Lagerstroemia floribunda* (Trabek Prey) (see Annex C). The report also recorded the status of tree health, with damage to trees being caused by insects, diseases and physical damage.

The total of urban green spaces in MPP is extremely small, with the land area given to urban garden landscaping accounting for only 0.16 per cent of the total urban area (see Annex D). The 2009 study by the Department of Public Transportation shows that about 55 per cent of trees in urban areas to be found in the street spaces and about 45 per cent identified potential to integrate tree planting in small proportion of land (e.g. schools, temples, centres etc.). The perceptions of the value of trees grown in MPP related predominantly to flowering, aesthetics, shade, timber and fruit. To achieve an understanding of how residents' value trees in urban areas, three districts were selected for evaluation, the criteria of selection being based on tree density, from low density in Khan Meanchey, medium density in Chamkar Morn, and high density in Toul Kork. Aerial photographs from 2008 were used to assist with this selection process.

3.2 Data collection

The data collected comprised a combination of interviewer-administered interviews and direct surveys. Brace (2004) reports that self-completed questionnaires remove a major source of potential bias in the responses, and make it easier for respondents to be honest about sensitive subjects. In this study, following an outline of the objectives of the survey, paper self-completion questionnaires were generally proposed to the respondents, to allow them to complete the survey forms outside of business hours. Each question in the survey form was associated with appropriate instructions to maximize and maintain the interest of respondents in the survey, and thereby ensure quality responses were obtained.

Immediately prior to the period in which individual respondent's completed the questionnaire, a detailed outline and explanation of the questionnaire was provided. Individual respondents were then left for a period of between 15 and 20 minutes to complete the questionnaire, but during this time the interviewer was always available to help respondents in relation to any aspects of the questionnaire that they did not fully understand. The data was collected during weekends and outside of regular working hours, at times when most people/ respondents would normally be at their homes.

Three teams were assigned to collect data in each district. Each team consisted of two persons, most of whom had substantial prior experience in undertaking surveys and collecting information, at community level. The surveys and related data collection commenced in November 15th and was completed by November 25th, 2010.

3.3 Small-group discussions

Small-group discussions served as the basis for construction of an initial version of the questionnaire (National Research Council, 1979). These small-group discussions were held in early September 2010, at the Department of Environmental Phnom Penh Municipality. This approach was used as no previous studies had been undertaken in Cambodia, where the principle of WTP was proposed to citizens, as the basis of quality improvement of urban trees and urban green spaces. Small-group discussions were organized based on the participation of the following stakeholders (Table 1):

Table 3.1: Meeting participant list for small-group discussions.

Small-group discussions
- A village chief representative of three districts
- Representative of citizens, five from each of the three districts
- Authority of Phnom Penh Water Supply
- Authority of Cambodia Electricity
- Officer, Department of Environmental Phnom Penh Municipality
- Officer, Department of Public Transportation
- Lecturers, Prek Leap National School of Agriculture

In the CV studies, critical consideration was the choice of an appropriate community payment vehicle (for urban tree improvement), as it was recognized that this would have a significant influence on the response to CV questions

(Rowe and Chestnut, 1983). The consensus reached in the discussions was the recommendation of three potential 'payment vehicles', these being surcharges to either water or electricity supply bills, or the formation of a UTF unit which would be managed by the community itself. In conclusion, the recommendation was for the formation of UTF unit. The stakeholder contribution on designing bid amount, which were recommended for respondents consideration were seven levels, ranging from about US$0.12 to US$0.85 (in Riel—500, 1000, 1500, 2000, 2500, 3000, and 3,500).

3.4 Questionnaire design

The final version of paper questionnaire comprised 21 individual questions developed in a standard format and divided into four different sections (Tyrväinen and Väänänen, 1998). The first section was composed of instruction, an introduction of potential benefits of urban trees in terms of clean air, energy conservation, and providing recreational spaces and other issues (see Annexs A and B). The second section raised questions relating to residential perceptions towards urban tree conditions. The first two questions stated general issues associated with urban environments and economic developments, by allowing each respondent to prioritize the issues. The third section described the crafted scenario for urban tree planting and maintenance schemes along the roads, gardens, institutions, and inhabited areas, followed by WTP related questions. The fourth section of the questionnaire concluded with a range of questions relating to the demographics and socio-economics of the interviewees (see Table 2). The questionnaire was accompanied by a covering letter from the Royal University of Agriculture. This covering letter explained the purpose of the survey and its importance to the people of Phnom Penh.

Table 3.2: Variables on which data was collected.

Demographic and socio-economic characteristics
• Gender
• Age
• Family size
• Marital status
• Occupation
• Education
• Income
• Place of birth
• Years living at address

3.5 Pre-testing of questionnaire

The pre-testing of an initial version of questionnaire was undertaken by interviewing 15 residents. Forsyth *et al*. (2004) recommended this approach to help with the prediction of actual problems that might be encountered in the actual conduct of the survey, as well as helping with the revision of the survey, based on the pretested survey results. Carson *et al*. (1996) in helping defines survey guidelines, also recommended careful pretesting of CV questionnaires. The questionnaires were prepared in two forms—a coloured version and a 'black-and-white' version, with the two stakeholders (the Royal University of Agriculture and the Department of Environmental Phnom Penh) being clearly indicated. In pre-testing the survey, it was found that the listing of the local government agencies was reflected by increased willingness to participate in the survey. With regard to the color format of the questionnaire, it was also found that the coloured (vs. black-and-white) received a higher response rate among the self-completion responds. Despite the pretest result, it was observed that identification of the survey with an academic agency was more likely to result in direct and honest responses relating to the issue and questions of community contributions to urban tree development initiatives. For this reason, the survey was more directly linked to the academically based institution.

There were some comments from some respondents in the pre-testing of the survey that parts of the survey questionnaire (particularly the section on three), were too long and difficult for them to understand on account of difficulties with the translation of some terms from English to Khmer. Such sections required revision before the actual conduct of the survey. The interview teams also underwent a period of 'interviewing practice' to maximize the effectiveness of the survey and the cooperation of respondents. On average, the survey took less than 20 minutes per respondent.

3.6 Representative sampling of respondents

Three-hundred-eighty-four respondents (384) were selected for the survey within the three districts. The selection of participants was based on a two-stage sampling technique. First, three districts were selected among eight districts, based on tree density cover in each area by using aerial photographs, combined with actual data on total urban gardens located in each district. The selected districts were sub-divided into street blocks, with every street block being assigned to 4 to 6 households for the conduct of face-face-interviews. Then, a

random sampling method was applied for the street blocks where the actual interviews would be undertaken. The sample sizes were determined using the guidelines of Krejcie and Morgan (1970) and data of population census in 2008 (NIS, 2009). The actual interviews were undertaken with family representatives older than 18 years.

3.7 Data analysis

The relationship between WTP and socio-economics such as gender, age, education, occupation, place of birth, house ownerships, duration of living in PP, in this study were assessed by using Pearson Chi-square analysis. The mean of WTP and socio-economic variables were using statistic description.

Street trees along the Russian Boulevard.
Photo by Cheng Sunhy

RESULTS AND DISCUSSION

CHAPTER FOURTH

Photo by Cheng Sunhy

4.1 Demographic and socioeconomics of the survey respondents

There was a total of 384 survey respondents, comprising approximately 59 per cent of male (n=226) and 41 per cent of female (n=158) (Table 4.1). Approximately 57 per cent of respondents were in the age group 21-35 years. In relation to educational status of respondents, approximately 42 per cent (n=160) had technical school qualifications, while a further 26 per cent (n=99) had completed high school. In reference to their occupations, approximately 38 per cent of registered themselves as students, while approximately 24 per cent indicated an involvement in small and medium businesses. Approximately 14 per cent of registered themselves as professionals. In reference to their place of birth, approximately 35 per cent indicated that they were born in MPP, while 37.5 per cent had moved from a provincial city or town to MPP. Approximately 20 per cent indicated that they had been born in a rural area of Cambodia.

The majority of respondent (68%) indicated that they rented their residences, while 32 per cent owned them. Almost 39 per cent (n=149) of respondents indicated that they had lived in MPP for less than 5 years.
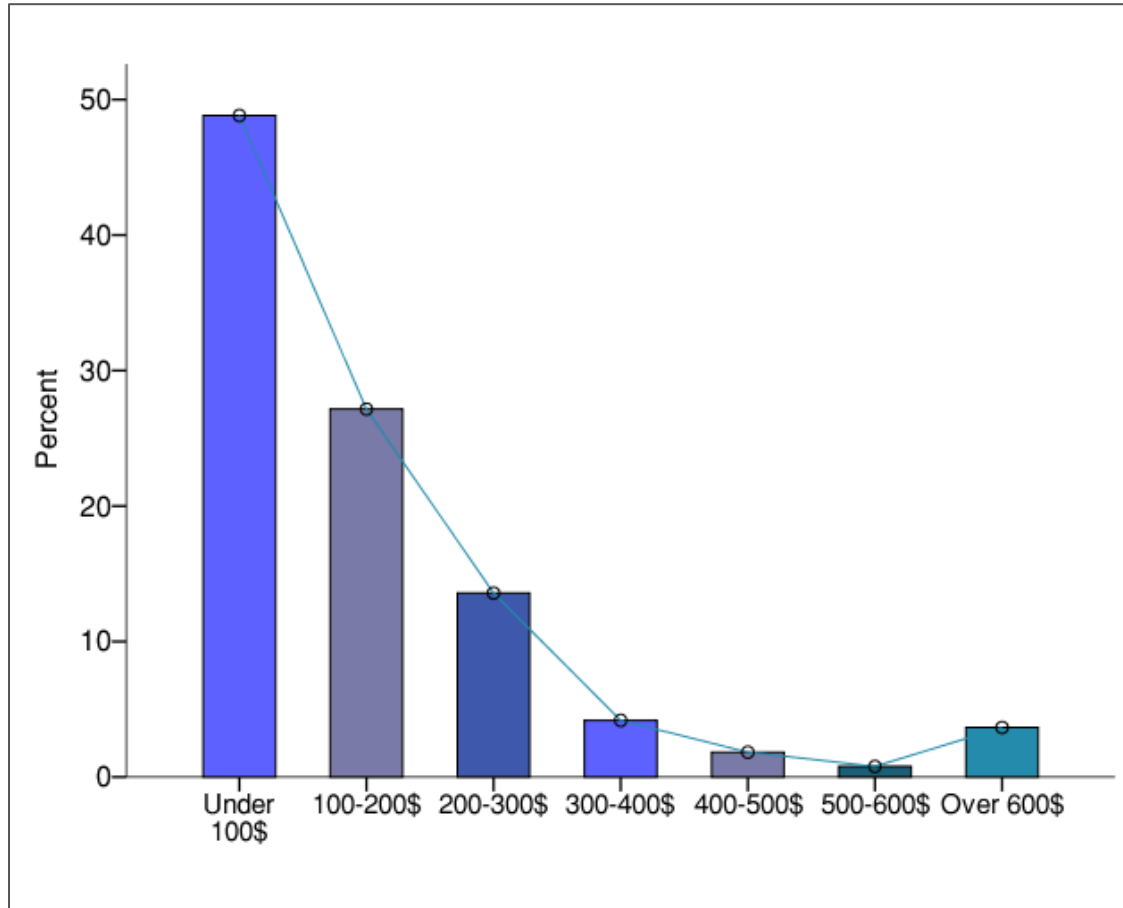
Figure 4.1: Categories of respondents' incomes.

The monthly incomes of the respondents are presented in Figure 4.1. About 48 per cent of respondents had monthly incomes of less than US$100. Less than one per cent had incomes in the range US$500 to US$600. The annual average income of respondents was approximately US$2,400.

4.2 Attitudes of respondents towards the urban environment

The priority issues of the respondents are presented in Table 4.2. About 41 per cent of respondents in the target areas identified the increased of heat intensity was a top priority issue in urban areas. This perhaps they were familiar to the changing of climate patterns in last few years. The studies were also consisted of other four optional problems and an open question to allow

Table 4.1: Demographic and socio-characteristic of respondents.

Variables (n=384)	Number	Percentage
Gender		
Male	226	58.9
Female	158	41.1
Age		
18-20 years	66	17.2
21-35 years	218	56.8
36-50 years	63	16.4
51-65 years	29	7.6
Over 66 years	8	2.1
Education		
Illiterate	18	4.7
Primary	27	7
Secondary school	69	18
High school	99	25.8
Technical school	160	41.7
University	9	2.3
Post graduate	2	0.5
Occupation		
Housewife	32	8.3
Student	147	38.3
Retired	13	3.4
Worker	14	3.6
Small to medium size business	91	23.7
Professional	54	14.1
Others (Painter, Staffs of NGO & Company)	33	8.6
Place of birth		
Rural area	77	20.1
Province	144	37.5
Suburban	27	7
Urban	135	35.2
Others (Kampuchea Kroam)	1	0.3
House Ownership		
Owner	123	32
Renter	261	68
Duration of living in MPP		
Under 5 years	149	38.9
5-10 years	82	21.3
11-20 years	85	22.1
Over 21 years	68	17.6

respondents to express their own opinions in relation to urban environmental issues currently being faced in the city. The respondents then showed their perceptions of unemployment rates which are in the order of 25 per cent. The study also found that about 3 per cent of the respondents were concerned with food security. As an illustration, Q.1 in the assignment was a statement of economic and environmental issues, to allow them to prioritize and rank issues. Environmental concerns were ranked among the most important. This response clearly indicated that the respondents were familiar with issues in their environment which have a potential to impact on the quality of the environment.
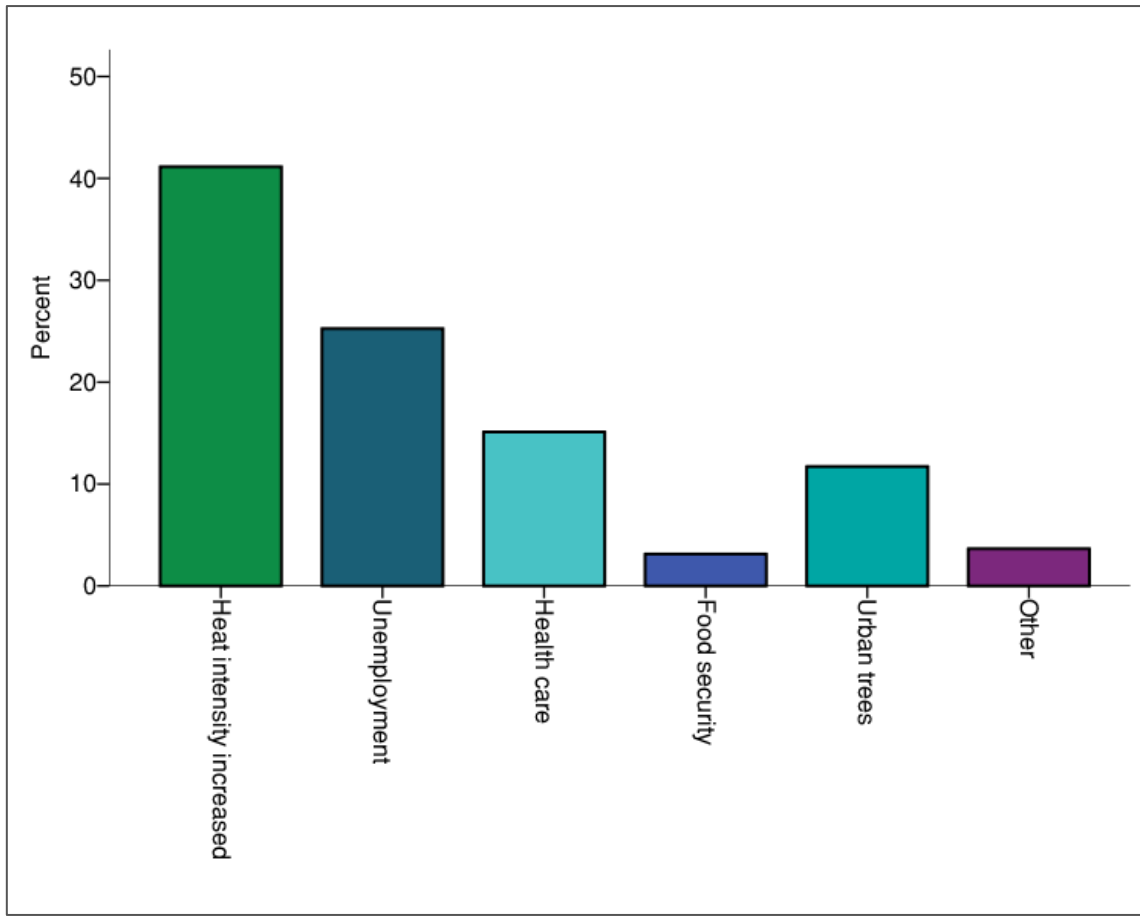
Figure 4.2: Prioritize issues in urban areas.

Q.2, three more problems (e.g. air, waste, and noise) were asserted to research platforms to consolidate a concept of urban tree development. Based on results illustrated in table 4.2, about 26 per cent of the respondents are likely to improve the management plan of urban trees as an integral part of urban infrastructures. The percentage of urban tree was reached below the highest level of reducing air pollution, which is accounting for 47.66 per cent, followed

by the managing of solid waste and reducing noise pollution was reported less priority so far in municipality.

Table 4.2: Priority rating of issues needing to be immediately addressed (Q2)

Statements	Percentage
1. Reduction in air pollution	47.66
2. Urban trees	26.04
3. Solid waste management	16.67
4. Reduction in noise pollution	7.03
5. Higher temperatures (climate change)	2.60

Further, we noted that a result of "increased heat wave" as illustrated in Q.1 has shifted into lowest level, when nature of Q.2 was asked to address problem urgently. The residents were stated the "reducing of air pollution" in urban areas are likely to be immediately addressed, followed by urban trees. This result certified the study by ADB (2006) reported the particulate matter identified as the potential causes of respiratory diseases and impacts on health of residents in MPP. Similarly, a study by Furuuchi *et al*. (2006) described the air temperature is sensitive to land use and influenced by traffic and river cooling effects during the daytime.

4.3 Resident perceptions towards urban trees

Residences reside in MPP were asked, Q.3 if they "Know" about urban trees. Table 4.3 showed that almost all of them have had knowledge of urban trees (334). Only a very small number of the respondents (50) reported "Don't Know." Q.4, if urban trees were "Important" to you, 93 per cent (357) indicated that it was important and about 5 per cent (21) suggested "Not Important".

In order to explain a relationship between residential perceptions of urban trees in term of knowledge and importance, a question on tree locations in front of the houses were specified. More than 46 per cent acknowledged that there were no trees in front of their houses. Fifty-four per cent commented cases of trees were planted by themself (40.9) and more than 12 per cent of already existences in the locations. Interestingly, despite trees were absences in residential areas, citizen identified with its importance remain high. This clearly indicated that people, who live in MPP, needs better tree cover, those we can increase by planting activities in urban areas.

Table 4.3: Perceptions of residents towards urban trees.

Statements	Sample		Number	Percentage
1. Do you know urban trees?	Know		334	87
	Don't know		50	13
2. Are urban trees are important to you?	Important		357	93
	Not important		6	1.6
	Don't Know		21	5.5
3. Are there are any trees in front of your houses?	No		178	46.3
	Yes	Plated	157	40.9
		Existed	49	12.8

The quality of urban trees was assessed by setting up three quantitative criteria (e.g. very satisfactory, satisfactory and unsatisfactory). In figure 4.2 was presented the result of each respondent, more than 43 per cent were unsatisfactory with current urban tree conditions. The essential reasons were given to low tree density in urban areas (66.07 per cent); lack of tree protection (17.26 per cent); poor selected species in planting (9.52 per cent); and lack of maintenance (7.14 per cent), as well as the satisfactory was about 41 per cent and 15.10 per cent expressed their views were very satisfactory.
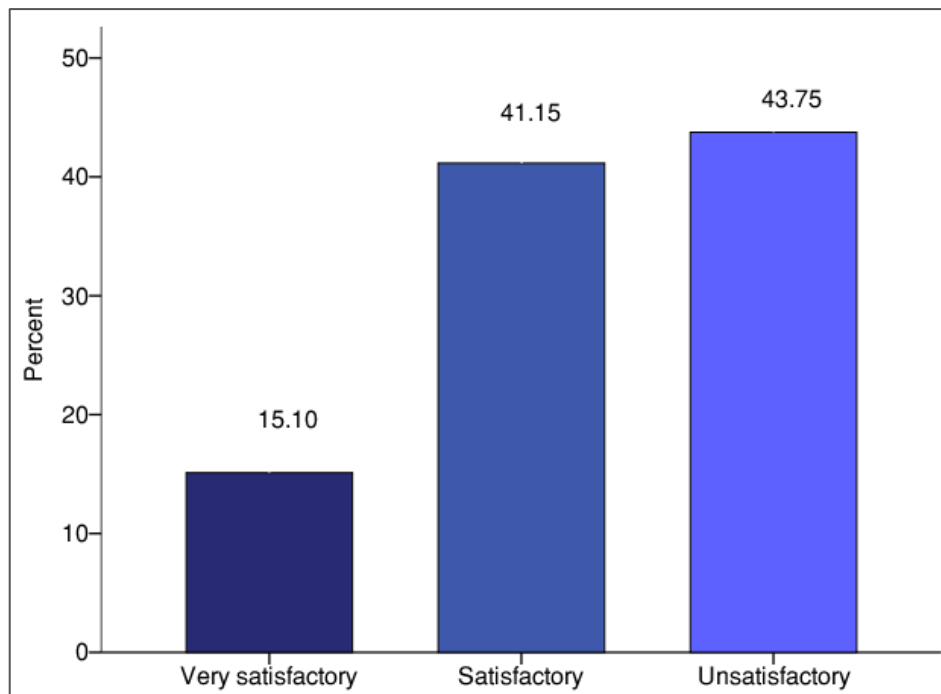
Figure 4.3: Percentage of respondents rated urban tree conditions.
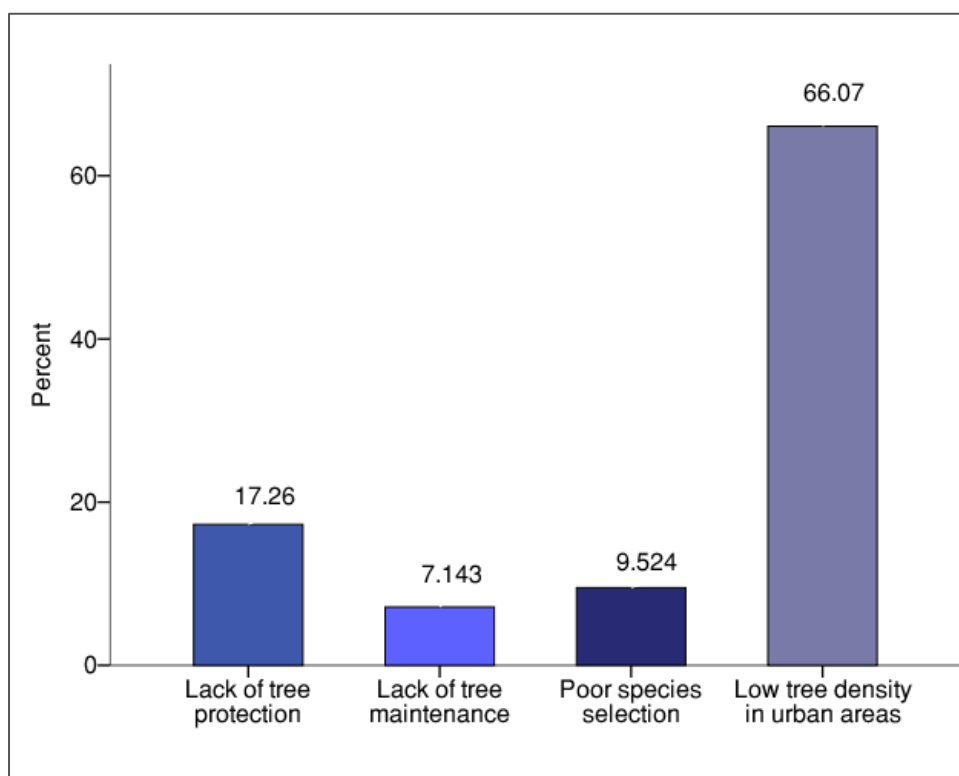
Figure 4.4: Reason of respondents not satisfied with urban trees.

4.4 Concepts for improving urban trees in Phnom Penh

4.4.1 A sample of scenario used for the study

The MPP is increasing tree planting in urban areas. The planting scheme will be made along the roads, gardens, institutional and inhabitant areas. To meet this objective, more tree species and equipment are required to fulfill the operation. If implemented it would mean that will maintain old trees and plant new species. However, this program cost much money. The Municipality of Phnom Penh regularly allocates a portion of its budget over US$3,500 annually for improving urban trees. However, this is not enough to cover the expenses for the implementation of the planting, maintaining programme. One way of paying for them is for your urban areas to set up an UTF paid for by urban residents. Fund revenue would be used for the programme described above they would not go to government.

However, setting up an UTF is very complicated. We are conducting this survey to find out if enough people in city would be willing to pay to make our city green. However, the amount of money raise or surcharge would be fixed for all households. The reasons that the raise and surcharge would be finished

after 10 years that is expected that would get enough money to establish a fund. The incomes from this fund could be used by the Urban Tree Project.

Please remember that: The survey you are participating in today is only to find out your opinions about this matter. We are simply interested in finding out how you would vote if an actual referendum would take place. We are requesting that you would answer based on how you would really vote if there will be an actual poll. Please vote positively in this survey only if you are really willing to pay a surcharge bill for UTF. If you have chance to vote on ballots, how would you vote on the following questions?

"Establish an UTF to meet tree planting and maintaining. This fund will raise your payment by _____ Riel per household per month."

How would you vote?

☐ .... For fund
☐ .... Against fund
☐ .... I don't know

4.4.2 UTF to improve urban trees

Among the valid 384 respondents, 165 individuals (account for 43 per cent) were positively voted for UTF on initial bid level 3,500 Riel per family per month (Table 4.4). In a subsample, 156 households were (about 40.6 per cent) purchased different ranges of lowest bid levels (Table 4.5). The number was relatively high once comparing to the responses of "Don't Know." This revealed that majority of them are interested in an initiative project. Minority of 63 households, voted (about 16.4 per cent) don't know by expressing their various concerns over a scheme (see Table 4.6).

Table 4.4: Highest bid level and percentage of residents voted for fund.

Statements	Number	Percentage
For fund	165	43
Against fund	156	40.6
Don't know	63	16.4
Total	384	100

In making-decision processes at lowest bid levels, when respondents voted "Against Fund", this probably bid was too high so that they are unable to pay even they are willing to improve it or want project exist. In this case, bid

amount was deducted ranging from 500 to 3,000 Riel/month (lowest than 3,500 Riel). So, they can decide to select an appropriate bid that they are able to afford by considering their monthly incomes basis. Regarding, respondents who voted "Don't Know", they will face to give the primary reasons. Why they voted "Don't Know?"

Table 4.5: Monthly bids for urban tree improvement for 10 years.

Number of bids	Frequency (259)	Percentage
500 Riel	32	12.4
1000 Riel	26	10
1500 Riel	17	6.6
2000 Riel	15	5.8
2500 Riel	0	0
3000 Riel	4	1.5
3500 Riel	165	63.7

Std. Deviation 1193.04, Mean: 2652.5.

Respondents who reported "Don't Know" or "Zero WTP" were then asked to indicate the reasons why they don't willing to pay for UTF. The majority of the responses not willingness to pay (41.3 per cent) felt that urban trees do not really need to improve the quality (Table 4.7). Lack of believes towards cost of urban trees that money claimed by 20.6 per cent. About 17.4 per cent also indicated that the situations presented to eliciting the information from them were too hypothetical situations and about 19 per cent of their concerns about the formulations of project plan will be not succession. Finally, about 4.8 per cent declared that the questions were morally offensive. According to Haener and Adamowicz (1998) implied that most "Don't Know" respondents seemed to feel that they didn't have enough information to answer the question appropriately. In this essence, perhaps the description of project was too short they were not able to make a decision.

Table 4.6: Primary seasons for not WTP.

Primary reasons	Number	Percentage
I don't believe that urban trees are worth that much	13	20.6
I don't really believe that trees are needed to improve	26	41.3
I don't think that the improving will be successful	10	15.9
I think this question is morally offensive	3	4.8
I think the situation presented is too hypothetical	11	17.4
Total	**63**	**100**

4.4.3 Payment vehicles for UTF

The respondents voted positively for fund to improve a quality of urban trees through planting and maintaining schemes, then continued to choose one of the following payment methods, such as water and electricity surcharged bills, and forming a unit of UTF to collect monthly fees from the residences, based on their preferences. The utilizations of payment vehicles in this research were derived from a result of our small-group discussions respectively (section 3.3). As a consequence, 140 responses indicated (53.7 per cent) to pay their own money through UTF, 70 interviewees (27.7 per cent) decided to pay surcharge on monthly water bill, and 49 households prefer through electricity bill. The distribution of payment vehicles was presented in Table 4.8.

Table 4.7: Subsample of respondents prefers to use payment vehicles.

Payment vehicles	Number	Percentage
Surcharge with water bill	70	27.7
Surcharge with electrical bill	49	18.6
Establish a unit of UTF to collect fees	140	53.7
Total	259	100

In table 4.7, the residences are preferred to pay money through UTF was moderately high. This figure generates interesting information to help in forming urban tree fund beyond using water and electricity bills. Further, if the decisions were made to improve quality of urban trees do exist and payment vehicles are subjects for debate. The policy makers should explore the database of each local authority (water and electricity) whether the numbers of households in urban areas were well connected. The main reason was that the urban infrastructures, in PP, were destroyed during the civil war included water and electricity utilities. At the present, government has invested huge of capital to build and expand systems, but number of people who settled in suburban areas or the poor segments limited of their access to those services. Thus selection of each payment vehicle should be assessed basically on service coverage, number of household connection, and social preferences.

4.4.4 Sample mean of WTP

Sample mean was performed with an extraction from a subsample that residences voted for fund (accounting for 165 respondents = 3500 Riel per month) plus against fund by WTP at lowest bid levels such as, 500 Riel, 1,000

Riel, 1500 Riel, 2000 Riel, 2500 Riel, and 3,000 Riel/month, accounting for 156 households in order to improve urban trees by planting and maintaining schemes. The calculation of sample mean here we simply used total residences voted for fund plus against fund and don't know responses then divided on total sample of population (n = 384). As a result of sample means revealed that the residences willingness pays for planting and maintaining by urban trees about 1,789 Riel per household/month with confidence level 95 per cent respectively (see Table 4.10). Thus the sample mean of each household's WTP per year will be written as 12 months multiply with 1,789 Riel = 21,400 Riel, equivalent to US$5.25 per household/year.

Table 4.8: Statistical description of WTP

WTP for urban trees (n=384)	
Mean	1,789
Standard error of mean	80.81
Median	1,500
Mode	3500
Standard deviation	1583.543
Variance	2507608.518
Range	3,500
Minimum	0
Maximum	3,500
Confidence level	95 per cent

4.4.5 Relationship between socio-economics and WTP

The relationship between WTP and socio-economics such as gender, age, education, occupation, place of birth, house ownerships, duration of living in MPP, were tested by using Pearson's Chi-square. The amounts of money that residents are WTP were significantly different between place of birth and occupation. More than 76 per cent of people moving from rural areas to live in PP are WTP bid level 3,500 Riel per month and about 64 per cent were from provincial town, as well as over 61 per cent live in PP in (x^2 = 35.6, p = 0.002). However, more people were born in MPP (15.3 per cent) than in rural areas (6.5 per cent) are WTP from 500 to 1000 Riel per month for increasing tree planting and maintaining. Gender, age, incomes, house ownership, and duration of living in MPP did not have significant with the amounts that they are WTP (Table 4.9).

Table 4.9: Percentage of residences WTP monthly for 10 years.

Variables (n=384)	500	1,000	1,500	2,000	2,500	3,000	3,500	X²	Sig.
Gender									
Male	10.3	8.3	7.7	5.8	0	1.9	66	3.99	0.551
Female	15.5	12.6	4.9	5.8	0	1	60.2		
Age									
18-20 years	11.6	7	2.3	7	0	4.7	67.4		
21-35 years	11.7	11.7	8.4	5.8	0	1.3	61.1		
36-50 years	12.5	7.5	5	5	0	0	70	17.2	0.637
51-65 years	20	10	5	0	0	0	65		
Over 66 years	0	0	0	50	0	0	50		
Education									
Illiterate	25	25	0	12.5	0	0	37.5		
Primary	16.7	0	0	5.5	0	0	77.8		
Secondary school	19.1	14.9	6.4	4.3	0	2.1	53.2		
High school	12.9	8.6	5.7	8.6	0	2.9	61.3	22	0.855
Technical school	8.1	9.9	8.1	4.5	0	0.9	68.5		
University	0	0	25	0	0	0	75		
Post graduate*	0	0	0	0	0	0	100		
Occupation									
Housewife	29.6	17.6	0	0	0	0	52.8		
Student	8.2	10.4	6.3	6.3	0	2.1	66.7		
Retired	30	0	10	0	0	0	60		
Worker	33.3	0	0	0	0	0	66.7		
Small to medium size business	9.8	9.8	6.6	9.8	0	3.3	60.7	33.6	0.297
Professional	4.8	11.8	14.3	2.4	0	0	66.7		
Others(Painter, NGO, Company)	20.8	8.3	0	8.3	0	0	62.6		
Place of Birth									
Rural area	6.5	6.5	2.2	6.5	0	2.2	76.1		
Province	18.4	9.7	5.8	0	0	1.9	64.2	35.6	0.002
Suburban	11.8	29.4	17.6	0	0	0	41.2		
Urban	8.6	8.6	7.5	12.9	0	1.1	61.3		
Residential Incomes									
Under $US100	16.9	5.9	5.1	5.1	0	1.7	65.3		
US$100-$US200	5.6	14.1	9.9	8.5	0	1.4	60.5		
US$200-US$300	10	15	5	5	0	2.5	62.5		
US$300-US$400	15.4	23.1	0	7.7	0	0	53.8	3.68	0.596
US$400-US$500	16.7	0	16.7	0	0	0	66.6		
US$500-US$600 $**	0	0	0	0	0	0	100		
Over US$600	12.5	0	12.5	0	0	0	75		

House Ownership									
Own house	10.1	11.4	6.3	2.5	0	2.5	67.2	3.68	0.596
Rent house	13.3	9.4	6.7	7.2	0	1.1	62.3		
Duration of Living in MPP									
Under 5 years	14.4	11.3	10.3	4.2	0	2.1	57.7		
5-10 years	13	13	4.3	6.5	0	0	63.2	9.5	0.85
11-20 years	12.5	9.4	6.2	6.2	0	1.6	64.1		
Over 21 years	8.2	6.1	2	8.2	0	2	73.5		

*Post graduate = 1 person, **US$500-US$600 = 1 person.

4.4.6 Population of WTP

The WTP of population resides in MPP can also be estimated from the total sample WTP. This we can use a result of WTP from a sample mean with total households of population. According to General Population Census in 2008 (NIS, 2009), the total number of households in MPP is 260,468 respectively. Therefore the total population of WTP may estimate per year will be 260,468 × 1,789 = 4,666 billion in Khmer Riel, which equivalent to US$1.14 million. If the discount rate is 10 per cent for the loss of poor segments/unconnected to urban utilities (water and electricity bills), for urban tree improvement, then the value of the population WTP is 4,666 billion Riel/10 = 4,665 billion Riel, which is equivalent to US$110,000.

4.5 Discussion

This study was employed CVM by assuming that over 1.3 million people living in city value at urban trees and the importance. The results serve the primary information for understandings the implication of public perceptions and WTP for demanding better functions and quantitative of urban trees. This finding was clearly providing a potential opportunity through residential participation basis to initiate urban tree improvement. As we see, the amount of money is very large and enough for municipality of MPP to carry out a 10-year plan by increasing planting and maintenance schemes. The result will benefit substantially for policy makers in changing policy and practice for urban tree management. This mean that the operation cost for urban tree programmes should be added about US$110,000 per year.

4.6 Conclusion and policy implications

The development in urban areas oriented for high building, houses, and new shopping centers cause severe damages to the natural lagoons and lakes that function significantly to absorb urban heat and restore micro-environment for human health. One way to improve this is to integrate tree elements into urban development programmes. However, financial sources and political support identify even more important to implement this plan. One possible way is to gather information with the involvement of residences to pre-define a situation.

The public perceptions correlated to the WTP viewed as key confidences to support policy makers in decision-making processes. In this context, the results from this study generated some interesting information to strengthen and decide how much urban tree movements should be committed to improve in the future reflected to urban population is increasing rapidly. As early indication, the demand of tree planting and maintenance services took place in MPP, which require more and better actions. The services are expected to fulfill in the following areas such as increasing tree density, providing tree protection, selecting good species, and maintenances.

Other measures are clearly indicated that the residences were prioritized and concerned with environment quality affect to their health as well as role of urban tree improvement. We can also be anticipated demanding urban trees with the residential participations through WTP, which the amount of money that they can afford within their economic conditions combined with benefits of urban trees, attached the value to individuals. The CVM application reveals that the individual's mean WTP for urban tree improvement is 2,1400 Riel per year (equivalent to US$5.2), which 0.4 per cent of average annual incomes of households. The total annual estimation for urban tree improvement (i.e. planting and maintenance) in MPP is 4,666 billion Riel (equivalent to about US$110,000). This amount of money in combination with public perceptions will be provided better indicators and evidences-bases in shaping policy and practices for urban tree improvement.

Specifically, the outcome from this study suggested for the following policy implications; (i) urban tree improvement can raise fund from residences; (ii) a master plan for urban trees need for study before project was realized; (iii) the management plan of urban trees require arts and sciences. Therefore, human resources to manage urban tree programme is the most important.

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Annex-A

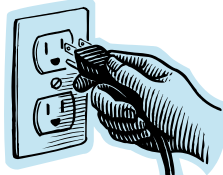Questionnaire in Khmer Version

សាកលវិទ្យាល័យភូមិន្ទកសិកម្ម

សាកលវិទ្យាល័យភូមិន្ទកសិកម្ម
សាលាក្រោយឧត្តម
ចំការដូង ខណ្ឌដង្កោ ភ្នំពេញ

ដើមឈើក្រុង ៖ តើវាផ្ដល់ប្រយោជន៍យ៉ាងណាចំពោះអ្នករស់នៅទីក្រុង?
បន្សុទ្ធខ្យល់ ជួយសន្សំសំចៃថាមពល ផ្ដល់កន្លែងសំរាកកំសាន្ត

ខ្ញុំបាទ ឈ្មោះ ចេង ស៊ុនហុី ជានិស្សិតនៅសាកលវិទ្យាល័យភូមិន្ទកសិកម្ម។ ខ្ញុំកំពុងធ្វើការ សិក្សាស្រាវជ្រាវអំពីការ *"វាយតំលៃនៃការកែលំអដើមឈើក្រុងដោយមានការចូលរួម"* ដែលជា ផ្នែកមួយនៃសារណាបទផ្ដាក់បរិញ្ញាប័ត្រជាន់ខ្ពស់។ ការសិក្សានេះ មានគោលបំណងសំខាន់ក្នុង ការវាយតំលៃការយល់ឃើញនិងចូលរួមរបស់ប្រជាជន ដើម្បីកែលំអគុណភាពបរិស្ថានបច្ចុប្បន្ន។

ភាពខ្វះខាត "តំបន់បៃតង" សំរាប់ការសំរាកកំសាន្តនៅក្នុងទីក្រុង គឺជាបញ្ហាសំខាន់សំរាប់ សុខភាពប្រជាជនទៅថ្ងៃមុខ ដោយសារតែមានការកើនឡើងនូវចំនួនប្រជាជនយ៉ាងឆាប់រហ័ស។ ជាងនេះទៅទៀត ក៏មានការកើនឡើងនូវកំដៅក្នុងទីក្រុង ដោយសារតែការប្រែប្រួលអាកាសធាតុ។ តទ្ទិលនៃកំដៅនឹងបណ្ដាលអោយអ្នករស់នៅក្នុងទីក្រុង ចំណាយពេលវេលាច្រើនស្នាក់នៅក្នុង ផ្ទះ ហើយប្រើប្រាស់ម៉ាស៊ីនត្រជាក់រឹកធ្ងន់ ដើម្បីការពារពីកំដៅ ពិសេសនៅរដូវប្រាំង។ ជាលទ្ធផល ធ្វើអោយមានកំណើនឡើងក្នុងការប្រើប្រាស់ថាមពលអគ្គិសនី និង ចំណាយប្រាក់ច្រើនទៅលើ ថ្លៃអគ្គិសនីប្រចាំខែ។

ការដាំដើមឈើនៅតាមដងផ្លូវ សួនច្បារ ស្ពាប់និងផ្ទះ៖ អាចជួយកែលំអតំបន់បៃតងនិងកាត់ បន្ថយកំដៅភាយចេញពីទីក្រុង។

ពត៌មានដែលបានប្រមូលនៅក្នុងការអង្កេតនេះ នឹងត្រូវបានរក្សាជាការសំងាត់ខ្ពស់បំផុត ដោយរំពឹងទុកថា លទ្ធផលនឹងអាចរួមចំណែកក្នុងការរៀបចំ និង អភិវឌ្ឍកម្មវិធីដាំនិងថែទាំដើម ឈើក្រុងដែលមានតទ្ទិលដោយផ្ទាល់ទៅលើលោក លោកស្រី។

ដូចធ្នេះ ការចូលរួមផ្ដល់ចំលើយរបស់លោក លោកស្រីពិតជា **មានសារៈសំខាន់ខ្លាំងណាស់** ។ លោក លោកស្រីត្រូវបានជ្រើសរើសជាមនុស្សសំខាន់សំរាប់ការអង្កេតនេះ ។

ផ្នែក២៖ ប៉ាន់ប្រមាណតំលៃនៃការយល់ឃើញនឹងឥរិយាបទលើស្ថានភាពដើមឈើក្រុង

សំណួរ១) តាមមតិរបស់លោក លោកស្រី តើអ្វីជា **បញ្ហាសំខាន់** នៅក្នុងទីក្រុងភ្នំពេញ? (*គូសចំលើយ១* ✔)

_____ : ការកើនឡើងនូវរំដៅ (បំបែរបួលអាកាសធាតុ)

_____ : អត្រាគ្មានការងារធ្វើ

_____ : បញ្ហាសេវាសុខភាព

_____ : សន្តិសុខសៀ្យង

_____ : ដើមឈើក្រុង

_____ : ផ្សេងទៀត (*សូមសរសេររបញ្ជាក់*): _____

សំណួរ២) តើបញ្ហាបរិស្ថានមួយណា ដែលលោក លោកស្រីយល់ថាគួរត្រូវយកមក **ដោះស្រាយបន្ទាន់**? (*គូសចំលើយ១* ✔)

_____ : ដើមឈើក្រុង

_____ : កាត់បន្ថយការបំពុលខ្យល់

_____ : គ្រប់គ្រងការបំពុលដោយសំលេង

_____ : គ្រប់គ្រងសំណល់រឹង

_____ : ផ្សេងទៀត (*សូមសរសេររបញ្ជាក់*): _____

សំណួរ៣) តើលោក លោកស្រីស្គាល់ **ដើមឈើក្រុង** ដែរឬទេ? (*គូសចំលើយ១* ✔)

_____ : ស្គាល់

_____ : មិនស្គាល់

សំណួរ៤) តើវាមានសារៈសំខាន់ចំពោះលោក លោកស្រីដែរឬទេ? (*គូសចំលើយ១* ✔)

_____ : សំខាន់

_____ : មិនសំខាន់

_____ : មិនដឹង

សំណួរ៥) តើមាន ''ដើមឈើ'' នៅចំពីមុខផ្ទះរបស់លោក លោកស្រីដែរឬទេ? (*គូសចំលើយ១* ✔)

_____ : មាន

_____ : មិនមាន **(→សូមរំលងសំណួរទី៦)**

សំណួរ៦) តើលោក លោកស្រីបានដាំរ ឬ ក៏វាមាននៅទីនោះស្រាប់? (*គូសចំលើយ១* ✔)

_____ : ដាំ

_____ : មានស្រាប់

សំណួរ៧) តើលោក លោកស្រីវាយតំលៃដូចម្ដេចចំពោះ**ស្ថានភាពដើមឈើក្រុង** បច្ចុប្បន្ន?
(*គូសចំលើយ១* ✔)

_____ : ពេញចិត្តខ្លាំងណាស់ **(សូមរំលងសំណួរ៨) → (សូមទៅកាន់ផ្នែក២)**

_____ : ពេញចិត្ត **(សូមរំលងសំណួរ៨) → (សូមទៅកាន់ផ្នែក២)**

_____ : មិនពេញចិត្ត **(សូមទៅកាន់សំណួរ៨ខាងក្រោម)**

សំណួរ៨) ប្រសិនបើលោក លោកស្រី **មិនពេញចិត្ត** នឹងស្ថានភាពដើមឈើក្រុងបច្ចុប្បន្ន ។តើ
មូលហេតុអ្វីបានជាលោក លោកស្រីមិនពេញចិត្ត? (*គូសចំលើយ១* ✔)

_____ : មិនមានការថែទាំ

_____ : មិនមានការការពារ

_____ : ប្រភេទឈើជ្រើសរើសដាំមិនសូវមានគុណភាពល្អ

_____ : ដើមឈើនៅក្នុងទីក្រុងមានកំរិតតិច

_____ : ផ្សេងទៀត (*សូមសរសេរបញ្ជាក់*): _____

🖎 *សូមបន្តទៅខាងក្រោយ*

សាលាក្រុងភ្នំពេញនឹងបង្កើននូវការដាំដើមឈើក្នុងតំបន់ទីក្រុង។ តំរោងនៃការដាំនឹងធ្វើឡើងតាមដងផ្លូវ សួនច្បារ ស្ថាប័ននិងផ្ទះ។ ប្រសិនបើអនុវត្តន៍ផែនការណ៍នេះ មានន័យថានឹង **ដាំប្រភេទថ្មីបន្ថែម ថែទាំ និងការពារដើមឈើចាស់ៗ**។ ប៉ុន្តែកម្មវិធីនេះចំណាយថវិកាជាច្រើន។ សាលារាជធានីភ្នំពេញបានបែងចែកថវិកាប្រមាណ **៣,០០០ដុល្លារ** ជាប្រចាំឆ្នាំ ទៅឲ្យគ្នាក់ងារ អនុវត្តដើម្បីកែលំអគុណភាព។ ដោយឡែក ថវិកានេះមិនគ្រប់គ្រាន់ក្នុងការចំណាយសំរាប់ការងារដាំនិងថែទាំកន្លងមក។ មធ្យោបាយមួយដើម្បីដំណើរការកែលំអដើមឈើក្រុង គឺ **បង្កើតមូល និធិតំបន់បៃតងក្រុង** ដែលមូលនិធិនឹងត្រូវបង់ដោយប្រជាជនរស់នៅក្នុងទីក្រុង។ មូលនិធិនឹង ត្រូវ ប្រើប្រាស់សំរាប់កម្មវិធីដូចបានរៀបរាប់ខាងលើ ដោយមិនយកទៅប្រើសំរាប់ថវិការដ្ឋឡើយ។

ប៉ុន្តែការបង្កើតមូលនិធិមានលក្ខណៈសុគតស្មាញ។ ការអង្កេតនេះដើម្បីស្វែងរកថា តើមាន ប្រជាជនគ្រប់គ្រាន់ទេស៊ូត្រចិត្តបង់ថ្លៃ ដើម្បីកែលំអបរិស្ថានអោយក្លាយជាទីក្រុងបៃតង។ ចំនួន ថវិកាដែលនឹងបង់ត្រូវថែរគ្រប់គ្រួសារទាំងអស់។ ហេតុផលនៃការបង់នឹងត្រូវ **ផ្តាកបន្ថាប់ពីរយៈ ពេល១០ឆ្នាំ** ដោយសង្ឃឹមថានឹងមានថវិកាគ្រប់គ្រាន់ដើម្បីបង្កើនមូលនិធិ។ ថវិកានឹងត្រូវបានប្រើ ប្រាស់ដោយតំរោងតំបន់បៃតងក្រុង។

<u>សូមកត់សំគាល់ថា៖</u> ការអង្កេតដែលលោក លោកស្រីបានចូលរួមថ្ងៃនេះ គឺជាការវាស់ស្ទង់ មើលអំពីមតិលើបញ្ហានេះ។ យើងចាប់អារម្មណ៍ក្នុងការស្វែងរក តើលោក លោកស្រីនឹងបោះ ឆ្នោតយ៉ាងណាប្រសិនបើការធ្វើប្រជាមតិមួយកើតឡើង។ សូមស្មើរថាលោក លោកស្រីនឹងផ្តល់ ចម្លើយថ្លែកលើភាពស៊ូត្រចិត្តពិតប្រាកដ ប្រសិនបើមានការបោះឆ្នោតកើតឡើង។ សូមបោះ ឆ្នោតគាំទ្រក្នុងការអង្កេតនេះ ប្រសិនបើលោក លោកស្រី ពិតជាស៊ូត្រចិត្តបង់ថ្លៃលើវិក្កយប័ត្រមួយ សំរាប់មូលនិធិតំបន់បៃតងក្រុង។

ប្រសិនបើលោក លោកស្រីមានឱកាសបោះឆ្នោត តើលោក លោកស្រីនឹងបោះឆ្នោតយ៉ាង ណាចំពោះសំណួរខាងក្រោម៖

សំណួរ៩) "បង្កើតមូលនិធិតំបន់បៃតងក្រុងដើម្បីបំពេញគំរូការពង្រឹកការដាំនិងថែទាំដើមឈើ" ដែលមូលនិធិនេះនឹងសូមអោយលោក លោកស្រីបង់ប្រាក់ចំនួន៣,៥០០ក្នុងមួយខែ។ *(សូមផ្តល់ ចំលើយ១ ✓)*

      : គាំទ្រមូលនិធិ **(សូមរំលងសំណួរ១០→១១→១២) (សូមទៅកាន់សំណួរ១៣)**

      : មិនគាំទ្រ **(សូមទៅកាន់ → សំណួរ១០)**

      : ខ្ញុំមិនដឹង **(សូមរំលងសំណួរ១០→១១) (សូមទៅកាន់សំណួរ១២)**

សំណួរ១០) ដូចថ្នេះ លោក លោកស្រីគិតថា <u>**មិនជ្រើសរើសសំរាប់មូលនិធិតំបន់បៃតងក្រុង**</u> នៅ ក្នុង តំលៃ **៣,៥០០៛** ក្នុងមួយខែ។ នៅសំណួរខាងក្រោម តើចម្លើយមួយណាដែលលោក លោកស្រី <u>នឹងធ្វើការជ្រើសរើស?</u> (*សូមផ្ដល់ចំលើយ១* ✓)

_____ : **ខ្ញុំនឹងបោះឆ្នោតយកមូលនិធិប្រសិនបើខ្ញុំបង់តិចជាង ៣,៥០០៛ (សូមទៅសំណួរទី១១)**

_____ : ខ្ញុំមិនចង់ចំណាយថវិការទៅលើការដាំដើមឈើទេ (សូមទៅសំណួរទី១៨)

_____ : ខ្ញុំមិនអាចលែលកក្នុងការបង់អ្វីទាំងអស់ (សូមទៅសំណួរទី១៨)

_____ : ដាំដើមឈើក្រុងមិនមានតំលៃអ្វីទាំងអស់ចំពោះខ្ញុំ (សូមទៅសំណួរទី១៨)

_____ : ខ្ញុំជំទាស់សំណួរដែលបានសួរ (សូមទៅសំណួរទី១៨)

សំណួរ១១) តើលោក លោកស្រីនឹងបោះឆ្នោតគាំទ្រមូលនិធិរីទេ ប្រសិនបើលោកនឹងបង់ថ្លៃ នូរ ចំនួនទឹកប្រាក់ដូចខាងក្រោមក្នុងមួយខែ? (*សូមជ្រើសរើស **ចំនួនខ្ពស់** បំផុតដែលលោក លោក ស្រី គិតថាអាចបង់ក្នុងមួយខែសំរាប់មូលនិធិ)* (*សូមជ្រើសរើសតួស* ✓)
(*សូមទៅកាន់* ➔ *សំណួរ១៣)*

តំលៃត្រូវបង់ក្នុងមួយខែ ចំពោះលោក លោកស្រី (៛)	ពិតជា មិនអាច	ប្រហែលជា មិនអាច	មិនប្រាកដ	ប្រហែលជាអាច	ពិតជាអាច
៥០០៛	①	②	③	④	⑤
១,០០០៛	①	②	③	④	⑤
១,៥០០៛	①	②	③	④	⑤
២,០០០៛	①	②	③	④	⑤
២,៥០០៛	①	②	③	④	⑤
៣,០០០៛	①	②	③	④	⑤

សំណួរ១២) ប្រសិនបើលោក លោកស្រីឆ្លើយ <u>**មិនដឹង**</u> មូលហេតុអ្វីបានលោកជ្រើសរើសយក ផ្នែកនេះ? (*តួសចំលើយ១* ✓)

_____ : ខ្ញុំមិនជឿថាដើមឈើក្រុងមានតម្លៃ៣,៥០០៛ ទេ (សូមទៅសំណួរទី១៨)

_____ : ខ្ញុំមិនជឿថាសំណើរដាំដើមឈើក្រុងនឹងទទួលបានជោគជ័យទេ (សូមទៅសំណួរទី១៨)

_____ : ខ្ញុំមិនជឿថាដើមឈើក្រុងគួរតែកែលំអទេ (សូមទៅសំណួរទី១៨)

_____ : ខ្ញុំគិតថាសំណួរនេះមានលក្ខណៈអសីលធម៌ (សូមទៅសំណួរទី១៨)

_____ : ខ្ញុំគិតថាស្ថានភាពដែលបានបង្ហាញមានលក្ខណៈស្រមើស្រមៃពេក (សូមទៅសំណួរទី១៨)

សំណួរ១៣) តើលោក លោកស្រីចង់ **បង់តាមមធ្យោបាយ** មួយណា? (*សូមផ្តល់ចម្លើយ១* ✓)

_____ : បង់តាមរយៈវិក្កយបត្រទឹក

_____ : បង់តាមរយៈវិក្កយបត្រភ្លើង

_____ : បង្កើតមូលនិធិតំបន់បៃតងក្រុងក្នុងការប្រមូលថវិកា

_____ : ផ្សេងទៀត (*សូមសរសេរបញ្ជាក់*): _____

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ផ្នែក៤៖ វាយតម្លៃលក្ខណៈសេដ្ឋកិច្ចសង្គមរបស់លោក លោកស្រី

សំណួរ១៤) តើលោក លោកស្រីភេទអ្វី? (*សូមផ្តល់ចម្លើយ១* ✓)

_____ : ប្រុស

_____ : ស្រី

សំណួរ១៥) តើលោក/លោកមានអាយុប៉ុន្មានឆ្នាំ? (*គូសចំលើយ១* ✓)

_____ : ១៨-២០ឆ្នាំ

_____ : ២០-៣៥ឆ្នាំ

_____ : ៣៦-៥០ឆ្នាំ

_____ : ៥១-៦៥ឆ្នាំ

_____ : ជាង ៦៦ឆ្នាំ

សំណួរ១៦) តើលោក លោកស្រីបានបញ្ចប់ការសិក្សាកំរិតណា? (*គូសចំលើយ១* ✓)

_____ : មិនចេះអក្សរ

_____ : បឋមសិក្សា (ថ្នាក់ទី១ ដល់ ថ្នាក់ទី៦)

_____ : អនុវិទ្យាល័យ (ថ្នាក់ទី៧ ដល់ ថ្នាក់ទី៩)

_____ : វិទ្យាល័យ (ថ្នាក់ទី១០ ដល់ ថ្នាក់ទី១២)

_____ : សាកលវិទ្យាល័យ

_____ : សាលាក្រោយឧត្តម

⚘ សូមបន្តទៅខាងក្រោយ

សំណួរ១៧) តើលោក លោកស្រីប្រកបការងារអ្វីដែរ? (*គូសចំលើយ១* ✓)

_____ : មេផ្ទះ

_____ : សិស្ស រី និស្សិត

_____ : មន្ត្រីចូលនិវត្ត

_____ : កម្មករជំនាញ

_____ : មុខចំនួញខ្នាតតូច

_____ : អ្នកមានជំនាញ (វិស្វករ មេធាវី គ្រូពេទ្យ គ្រូបង្រៀន...។ល។)

_____ : ផ្សេងទៀត (*សូមសរសេរបញ្ជាក់*): _____

សំណួរ១៨) តើលោក លោកស្រីកើតនៅឯណា? (*គូសចំលើយ១* ✓)

_____ : ជនបទ

_____ : ខេត្ត

_____ : ជាយក្រុង

_____ : ទីក្រុង

_____ : ផ្សេងទៀត (*សូមសរសេរបញ្ជាក់*): _____

សំណួរ១៩) សំណួរនេះពិតជាមានសារ:សំខាន់ខ្លាំងណាស់ដើម្បីកំណត់ភាពចង់បានរបស់ ប្រជា ជន នៅក្នុងការចូលរួមលើកកំពស់គុណភាពដើមឈើក្រុង។ សូមលោក លោកស្រី ផ្ដល់ចំលើយ ពិតប្រាកដ អំពីប្រាក់ចំណូលប្រចាំខែទាំងស្រុងរបស់លោក លោកស្រី? (*សូមផ្ដល់ចំលើយ១* ✓)

_____ : ក្រោម១០០$

_____ : ១០០ ទៅ ២០០$

_____ : ២០០ ទៅ ៣០០$

_____ : ៣០០ ទៅ ៤០០$

_____ : ៤០០ ទៅ ៥០០$

_____ : ៥០០ទៅ៦០០$

_____ : ជាង៦០០$

សំណួរ២០) តើផ្ទះដែលលោក លោកស្រីកំពុងរស់នៅជួលគេ ឬជាកម្មសិទ្ធផ្ទាល់ខ្លួន? (*គូសចំលើយ១* ✓)

_____ : ជួល

_____ : កម្មសិទ្ធផ្ទាល់ខ្លួន

សំណួរ២១) តើលោក លោកស្រីរស់នៅទីនេះអស់រយៈពេលប៉ុន្មានឆ្នាំហើយ? (*គូសចំលើយ១* ✓)

_____ : តិចជាង៥ឆ្នាំ

_____ : ៥-១០ឆ្នាំ

_____ : ១១-២០ឆ្នាំ

_____ : ច្រើនជាង២០ឆ្នាំ

✎ សូមសរសេរមតិយោបល់ខាងក្រោម - គ្រប់មតិទាំងអស់ (បើមាន)

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សូមអគុណ

Annex-B

Questionnaire in English Version

Royal University of Agriculture

Graduate School
Faculty of Rural Development
Chamkar Daung, Dangkor, Phnom Penh, Cambodia

URBAN TREE – HOW IS IMPORTANT FOR RESIDENT LIVE IN URBAN AREA?

CLEAN AIR, ENERGY CONSERVATION, AND RECREATION

My name is **Cheng Sunhy**, a Master Student at the Royal University of Agriculture. I am conducting a study on '***Estimated Value of Urban Trees Improvement through Residential Participation***', as a part of my thesis for the requirement of the Masters' Degree of Rural Development. The study aims to assess residential perceptions attached to urban trees and level of public participation for quality improvement in Phnom Penh city.

Insufficient urban green space for residential recreation is a major threat to human health since population is increasing sharply. In addition, there is also a concern about climate change that affects urban heat intensity in the city. Therefore, residents would spend long time to stay at home and use air conditioner or fan to keep cool, particularly during the dry season. This would result in increased energy consumption and high electric bill. There will be likely opportunities to improve green space and cool urban temperature by planting trees in small proportion of land such as streets, gardens, institutions and household areas, but cost of urban tree planting and managing are high. Furthermore, a low budget allocation for urban tree programme creates a major challenge for urban tree improvement. The present tree density in Municipality of Phnom Penh is relative low, and some species selected for planting are not able to provide better function such as crown and flower to the city.

This survey is designed to determine your perceptions associated with recent quality of urban tree, and your willingness to participate to improve its quality. All the information being collected in the survey is strictly confidential. It is expected that the findings of this survey may contribute to the design and development of urban tree policies that affect you directly as a citizen. **Hence, your answers are very important!** You are selected as an important person to take part in this survey, which represent the urban resident in city.

This survey should not take more than 20 minutes to complete

THANKS FOR YOUR COMPLETION

Please don't identify your name anywhere on the questionnaire. If you have any questions or comments about questionnaire, please called **Cheng Sunhy** at (+855)97 8 535 888, (+855)17 606 608 or send to kimsrean@gmail.com.

Q1. In your opinion, what are the top priority problems facing in our city? (You can choose three answers, *please write rank number 1 → 3*)

      _____ : Heat intensity increased (climate change)

      _____ : Unemployment

      _____ : Health care

      _____ : Food security

      _____ : Urban trees

      _____ : Others, *please specify:* _____

Q2. Which problem is the most urgent environmental problem in Phnom Penh that you would like immediately to address? (You can choose three answer, *please write number 1 → 3*)

      _____ : Urban trees

      _____ : Air pollution

      _____ : Noise pollution

      _____ : Solid waste management

      _____ : Heat wave increased (climate change)

      _____ : Others, *please specify:* _____

Q3. Do you know about urban trees? (Choose one answer, *please write the number*)

      _____ : I Know

      _____ : I don't know

Q4. Are urban trees important to you? (Choose one answer, *please write number*)

      _____ : Important

      _____ : Not important

      _____ : Do not know

Q5. Are there any trees in front of your houses? (Choose one answer, *please write number*)

      _____ : Yes

      _____ : No (If no, *please skip Q6 and go to Q7*)

Q6. Do you plant the trees or they were there when you moved there? (Choose one answer, *please write number*)

      _____ : Planted

      _____ : Already existed

Q7. How do you rate the urban trees condition in our city? (Choose one answer, *please write number*)

_____ : Very satisfactory (*Please skip Q8 and go to part III*)

_____ : Satisfactory(*Please skip Q8 and go to part III*)

_____ : Unsatisfactory (*Please go to Q8*)

Q8. If you are <u>not satisfied</u> with urban trees condition, please state your primary reasons for your dissatisfaction? (Choose one answer, *please write number*)

_____ : Lack of tree protection

_____ : Lack of tree maintenance

_____ : Poor species selection

_____ : Low percentage of tree species in city

_____ : Others, *please specify:* _____

Section 3: Willingness to Pay Scenario for Urban Trees Improvement Project

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The Municipality of Phnom Penh is increasing tree planting in urban areas. The planting scheme will be made along the roads, gardens, institutional and household areas. To meet this objective, more tree species and equipment are required to fulfill the operation. If implemented it would mean that will maintain old trees and plant new species. However, this program cost much money. The Municipality of Phnom Penh regularly allocate a portion of its budget over 3,000$ annually for improving urban trees. However, this is not enough to cover the expenses for the implementation of the planting, caring and educational programme. One way of paying for them is for your urban areas to set up an '**Urban Tree Fund**' paid for by urban residents. Fund revenue would be used for the programme described above they would not go to government.

However, setting up an Urban Tree Fund is very complicated. We are conducting this survey to find out if enough people in city would be willing to pay to make our city green. However, the amount of surcharge would be fixed for all households. The reasons that the surcharge would be finished after 10 years that is expected that would raise enough money to establish a fund. The incomes from this fund could be used by the Urban Trees Project.

**Please remember that**: The survey you are participating in today is only to find out your opinions about this matter. We are simply interested in finding out how you would vote *if* an actual <u>referendum</u> would take place. We are requesting that you would answer based on how you would really vote if there will be an actual poll. *Please* vote positively in this survey only if you are really willing to pay a surcharge bill for urban tee fund.

If you have chance to vote on ballots, how would you vote on the following questions? 'Establish an Urban Tree Fund (UTF) to meet tree maintaining costs, planting and education. This fund will raise your payment by <u>3,500 Riel</u> per household <u>per month</u>'

Q9. How would you vote? (Choose one answer, *please write number*)

_____ : For fund *(Please skip Q10, Q11, and Q12, go to Q13)*

_____ : Against fund *(go to → Q10)*

_____ : I don't know *(Please skip Q10, Q11, go to Q12)*

Q10. So, you think that you <u>would not vote</u> for UTF at a cost of 3,500 Riel per month. Which of the following best describes your 'no' responses to **Q9** (*Choose one answer*)

_____ : I would vote for 'Fund' if it cost me some money, but less than 3,500 *(→Q11)*

_____ : I don't want to put money on improving trees *(Please go to Q14)*

_____ : I can't afford to pay anything *(Please go to Q14)*

_____ : Improving urban trees are not worth anything to me *(Please go to Q14)*

Q11. Would you vote for UTF if it would cost you these amounts each month? (*Please circle the highest amount that you would pay <u>**each month**</u> for urban trees project*)

Cost to you per month	Definitely no	Probably no	Not sure	Probably yes	Definitely yes
500 Riel	A	B	C	D	E
1,000 Riel	A	B	C	D	E
1,500 Riel	A	B	C	D	E
2,000 Riel	A	B	C	D	E
2,500 Riel	A	B	C	D	E
3,000 Riel	A	B	C	D	E

Q12. If you 'Don't know': why did you choose this category? (*Please choose one*)

_____ : I do not believe that urban trees are worth that much *(Please go to Q14)*

_____ : I do not think that the improving proposal will be successful*(Please go toQ14)*

_____ : I do not really believe that urban trees are needed to improve*(Please go toQ14)*

_____ : I think this question is morally offensive *(Please go to Q14)*

_____ : I think the situation presented is too hypothetical*(Please go to Q14)*

Q13. What <u>payment vehicles</u> do you prefer? (Choose one answer, *please write number*)

_____ : Surcharge with water bill

_____ : Surcharge with electric bill

_____ : Established a unit of UTF to collect fee

_____ : Others, *please specify:* _____

Section 4: Assessing the Respondents' Socio-economic Characteristics

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Q14. What is your age? (Choose one answer, *please write number*)

_____ : Under 20 years

_____ : 20 to 35 years

_____ : 36-50 years

_____ : 51-65 years

_____ : Over 66 years

Q15. What is your education level? (Choose one answer, *please write number*)

_____ : Illiterate
_____ : Primary school
_____ : Incomplete high school
_____ : Complete high school
_____ : Technical education
_____ : University
_____ : Post graduate

Q16. What is your occupation? (Choose one answer, *please write number*)

_____ : Unemployed
_____ : Housewife
_____ : Student
_____ : Retired
_____ : Worker
_____ : Small to medium size business
_____ : Professional (engineer, lawyer, physician etc.)
_____ : Other, *please specify:*

Q17. This question is great importance in determine people's preferences in improving urban trees quality. Could you please tell us which is your entire household's income falls (all sources of incomes and from all incomes earners)? (Choose one answer, *please write number*)

_____ : Under 100$
_____ : 100 to 200$
_____ : 200 to 300$
_____ : 300 to 400$
_____ : 400 to 500$
_____ : 500 to 600$
_____ : Over 600$

Q18. Do you rent or own your house? (Choose one answer, *please write number*)

_____ : Own
_____ : Rent

Q19. Where do you grow up? (Choose one answer, *please write number*)

_____ : Rural area
_____ : Suburban area
_____ : Urban area
_____ : Others, please specify: _____

Q20. How long do you live in current address? (Choose one answer, *please write number*)

_____ : Less than 5 years
_____ : 5 to 10 years
_____ : 11 to 20 years
_____ : More than 25 years

Annex-C

List of dominant trees species planted in urban areas

N°	Scientific Name	Khmer Name	Family Name
1	*Lagerstroemia indica*	In Tanel*	Lythraceae
2	*Cassia fistula*	Loeung Reach*	Fabaceae
3	*Caisalpinia pulcherrima*	Kra Ngeouk*	Fabaceae
4	*Hopea odorata*	Koki**	Dipterocarpaceae
5	*Cassia simensis*	Ang Kanh**	Leguminosae-Caesalpinioideae
6	*Lagerstroemia floribunda*	Trabek Prey*	Lythraceae
7	*Tamarindus indica*	Am Pil***	Fabaceae
8	*Peltophorum dasyrrhachis*	Tra Sek**	Legumiinosae-Caesalpinioideae
9	*Mangifera indica*	Svay***	Anacardiaceae
10	*Swietenia macrophylla*	Krab Bek**	Meliaceae
11	*Swietenia sp.*	Pong Ko**	Meliaceae
12	*Eugenia jambos*	Chum Pou***	Myrtaceae

Tree planting purposes: * *flower, ** shade and timer, *** fruit and shade*

Annex-D

Number of gardens and greening areas in Phnom Penh

Nº	Districts	Number of Gardens	Size (m²)
1	Chamkar Morn	8	70,397
2	Prampi Makara	8	38,117
3	Daun Penh	18	322,582
4	Tourlkork	4	26,400
5	Dang Kor	3	26,240
6	Ruessey Keo	3	170 750
	Total	**44**	**654,486**