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# Willingness to Sell (WTS): An Incorporative Market Research of Contrastive Testing on WTP, WTS and WTA

by

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# Willingness to Sell (WTS): An Incorporative Market Research of Contrastive Testing on WTP, WTS and WTA

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## Abstract

Since Environmental strategy assessment is becoming an important topic in more and more countries or areas, the economic valuation of environment/ ecosystem service/ public service/ public goods has been a key problem when evaluating the whole projects. And Contingent Valuate Method is a main methodology to valuate the public goods in the past 50 years, while both the techniques of Willingness to Pay and

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Willingness to Accept are always under the argue of their huge bias, less of objectivity, and external interference factors.

This research offers a new technique called Willingness to Sell (WTS) to valuate the non-market goods; the objective of this research is 1.Build the WTS theory; 2.Verify the piu-objectivity of WTS compared with WTP and WTA by using incorporative market contractive method; 3. Conclude the limitation of WTP, WTS and WTA in the economic valuation application and enrich the CV Method theory.

The result confirm that Willingness to Sell is a more objective technique in New Contingent Valuate Method and it is very suitable to valuate general public goods and public services; Besides, through the correlation analysis of many respondents' index, many discussion details about influence factors on WTP, WTS and WTA are concluded out in this research.

This research contributes a new technique and enriched the Contingent Valuate Method greatly; it makes Contingent Valuate Method actually feasible in economic market and can provide advisable financial support for government when doing Environmental Strategy Assessment.

**Keywords:** Contingent Valuate Method (CV Method), Willingness to Sell (WTS), Willingness to Pay (WTP), Willingness to Accept (WTA), Willingness to Depreciate (WTD), incorporative market, public service projects

# 1 Introduction

This research provides a new solution of valuating environmental resources/ ecosystem services/ public goods more objectively in Contingent valuation method (CV method). Another new technical support is added into CV method called willingness to sell (WTS); and in this research an incorporative market method will be employed to valuate public-service projects comparatively by conducting willingness to pay (WTP), willingness to accept (WTA) and willingness to sell at the same time on two different projects.

## 1.1 Foreword

Since CV method is developed from the technique of survey research (Mitchell & Carson, 2013), researches design a series of questions to establish circumstances in every single case and conduct the survey research to conclude the value out (Rea & Parker, 2012). In general, the CV Method is lack of generality and cannot be achieved by following rigid rules (Mitchell & Carson, 2013), because it always depends on the details of each case (Yin, 2013), that's also the reason why it is called contingent method (Portney, 1994). The essence of CV method research is about the study design and careful implementation (Carson, Flores & Meade, 2001), if each aspect of survey process is well conducted, the value of result will be with more precision, accuracy, and credibility (Fowler, 2008). And in CV method research, the overall design and strategy must be set into important position to explore every detail of a valuation program (Hakim, 1987).

In order to assess the quality of each case study more reliable and replicable (Yin & Heald, 1975), Researches use techniques and guidance applying to different case studies to test the heuristic identification of new variables and hypotheses (George & Bennett, 1975), and all the techniques employed in conducting survey questions can be divided into willingness to pay (WTP) and willingness to accept (WTA) (Shogren, Shin & Hayes, et al, 1994).

## 1.2 Literature Review of CV Method

After a foreword of CV Method, it is extremely necessary to stress one more time on the reason why doing environment valuation is necessary. Of cause nature comes much earlier than human beings, and social comes later than human and then economic comes. So, in fact, Nature is priceless because nature is forever but economic is just a production of time. But why we still need to know the environment value? Because the government should know how much we should pay to keep the balance of nature and human activities of today.

**Goods Chain:**


**Figure 1. Goods Chain in Environmental Economy**

王金南.环境经济学：理论方法政策. 清华大学出版社, 1994.

Figure 1. is one of the important theory foundation of WTP and WTA. All the goods in this world can be divided into pure private goods, private goods, quasi public goods and pure public goods. From left to right are the different kinds of goods with different divisibility, excludability and externality more or less.

WTA techniques consider environment/eco-system service as pure private goods, and WTP techniques consider environment/ eco-system service as pure public goods. While, actually, there are not so many pure private and pure public goods in the real world, household goods is the closest to pure private on the left and national defense is the closest to pure public goods on the right.

## 1.3 Weakness of WTA and WTP

However, in environmental economy, environment and ecosystem service belongs to neither pure private nor pure public, most of them belong to the middle space, called quasi-public goods. So, if Hypothesis of WTP considers environment as a pure public good, there will be some implicated information: The consumers have NO ownership of environment service, non-payment equals no service (no better service). And at the same time, WTA considers environment as a pure private good, the implication of WTA is: The consumers possess the ownership of environment service, sold out means to give up using. WTA is not so widely used as WTP for it's huge bias, and WTA value is always many times bigger than WTP value even in one same research, the first research on WTA found it is four times bigger than WTP. Although compared to WTA, WTP has been taken in more valuation researches, but is WTP really a perfect way to valuate public goods? The answer is NO.

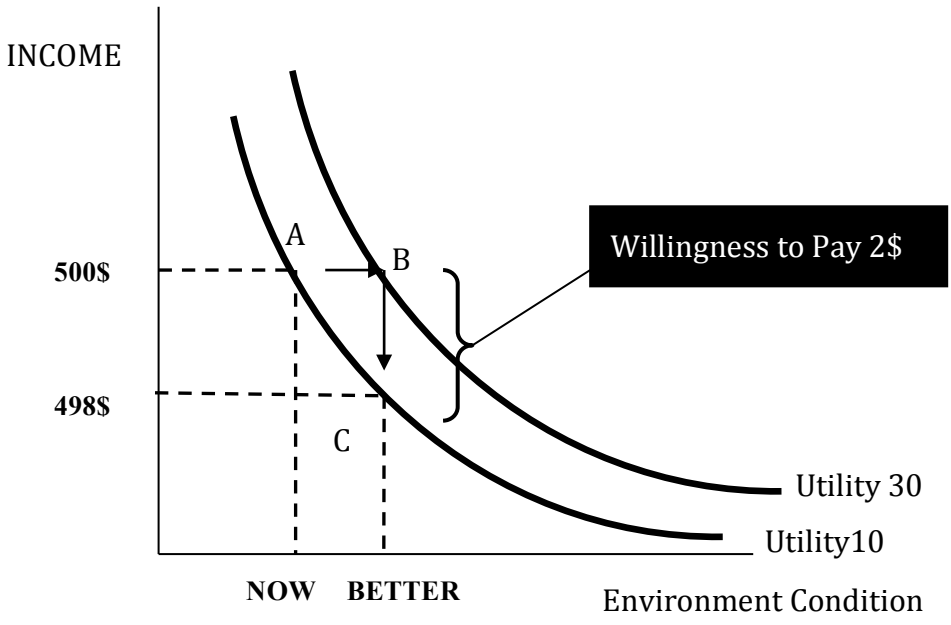



**Figure 2. Indifference Curve of Utility in Willingness to Pay**

日本評論社, et al. 図解 環境評価と環境会計図解 環境評価と環境会計, 2000.

Figure 2. is an important theory basis of WTP in environmental economy, but there

is a extremely important factor called INCOME, it means a WTP value is influenced by income level, and a WTP value is NEVER bigger than income. So, if a WTP value is used to represent the value of environment while the income level is deciding the WTP value, finally it becomes into the personal income level is deciding the value of the environment. This is the biggest weakness of WTP. Although many respondents responded positively on the importance of ecosystem service in many researches, the willingness of the financial contribution is still difficult to conclude (Yoshino, 2010), and the reason is that: usually the WTP value is a subjective value which is strongly depended on the personal income level.

Besides, another trouble of WTP is that, what we get is just the unit WTP, and if it is necessary to conclude a total value, the unit WTP must be multiplied by a population size. Population size is another big weakness of WTP. For example, if there is a city landscape but with international fame, how to decide the population of this unit WTP? It should be a town population size, a city size, a nation size or the world size?

## 1.4 research objective

The large research objective of this research is to find a better method to valuate public goods/environment/ecosystem service; it should be more objective than WTA and less external factors than WTP such as personal income level and population size. Finally, enrich the CV Method theory.

# 2 Theory of Willingness to Sell

## 2.1 Definition of WTP, WTA, and WTS in new CV Method

In this research, a new definition of NEW CV Method will be given, in more macroscopic view by the distinction of the attribute of activities that affect the environment:

The definition of willingness to pay (WTP): How much can be paid for the positive activity which affects the environment. The definition of willingness to accept (WTA): How much must be compensated for the negative activity that affects the environment.

Besides WTP and WTA, a new technique called willingness to sell (WTS) will be put into use in this research, and the definition of willingness to sell (WTS): How much can public goods/ecosystem service be sold if the ownership transfers.

If the three techniques are classified by the different stance of respondents, WTP hypothesis as a common user of pure public goods and WTA hypothesis as a owner of pure private goods. But in WTS case, you (respondent) are just you, with your own opinion on the environment valuation.

## 2.2 Theory basis of WTS

### 2.2.1 Distributor Theory/Salesman Theory in Economics

The first theory basis of WTS in economics principle can be called Distributor Theory. Not only when people hold the ownership can they sell, in general, the distributor holds the ownership of product and hires sales staff and service staff to do business activities as dealer management (Stalk, Evans & Sgulman, 1992). A distributor (dealer) is a unit / person in a particular area and domain, who holds sales activities or service (Churchill, 1979). Dealers hold independent institutions, ownership of goods (buy out the manufacturer's product / service), and obtain the operating profit (Lucking-Reiley & Spulber, 2001). In general, dealer is dependent on a supplier and

supplier takes control of dealer decisions (Provan & Skinner, 1989), while management of diversified business and business process don't/or rarely, stay under the constraints of the supplier (Frazier, Gill & Kale, 1989), and take rights and responsibility with the suppliers equivalently of the interest and interdependence (Rideway, 1957). Sales staff is the personnel who does direct sales (Churchill, Ford & Walker, et al, 2000), including general manager, business manager, marketing manager, regional manager, business representatives, etc. Both dealer and sales staff are related to the market, and sales staffs accomplish their jobs by sales behavior, technology, and management as dealer's executive (Anderson, 1996). That is the difference between dealer and sales staff, if it classified according to whether hold the ownership, the dealer holds the ownership of products while sales staff does not, and sales staff got sales compensation and commissions with deferent proportion of salary (Tremblay, Côté & Balkin, 2003). We all know in real market, the staff who sells the goods in the shops or the salesman of technology projects, although the product or projects don't belong to themselves while buyers sometimes really think they bought from the salesman or contracted sales contract with the salesman. It means having no ownership will not affect sales behavior of sales staff.

Sales channel refers to all the Enterprise or individual that (1) obtain the ownership of goods or services or (2) to help to transfer ownership thereof, when the ownership of a certain kind of goods or services transfer from the producer to the consumer (Donaldson, 2007).

Here we talk about the hypothesis to be used in contingent valuation method, as the enterprise/individual that help to transfer ownership, actually they are conducting sales behaviors without the ownership of the product, which can be generally called sales staff. When sales staff takes part in sales market, one of the most important prerequisite elements is that the COST PRICE. In the simplest sales model, a salesman can start sales if only the master has told him the cost price of the product. If with better sales technique skills, the sold price may be many times more than a cost price, while not every salesman would like to do that because it according to the regulations and principles of how the master decide the commission settlement. If the commission is depend on the number of consumers, the sales staff would tend to reduce the sales price on the basis of not being less than the cost price (sometimes a temporary cost loss is also accepted as a strategy to win customers); and if the sales

staff get a ratio paid according to the amount of sales volume, the sales staff maybe try very hard to improve the sales price as far as possible. While in both cases, the cost price is the most important element and it provides an intuitive price reference.

In the hypothesis of CV method, it will be enough for environment sales staff just knowing the cost price, while there is no cost price of environment and what we want to know is just the "cost price" of environment, so we can use this "sales staff" method to ask people to valuate the "cost price" of environment in their mind, and the cost price of the public goods in their mind is just the value of the public goods from their personal view; of course it also can be employed into the valuation of human activity or government projects.

### 2.2.2 Ownership Theory in Economics

Another theory basis of WTS in economics principle is about the discussion of ownership. In economics, ownership cost and owner ship benefit is always a pair, and they usually happened together, while when applying WTA valuation, actually it conducts a fictitious market to set conditions of a transfer of ownership with completely ignoring ownership cost (Grossman & Hart, 1986). Considering only the ownership benefits makes WTA always causing big bias and lack of feasibility, reliability and validity. Ignores ownership cost only think about ownership benefit, it is root cause of the huge bias of WTA. If ask a person suppose a big park is yours and how much money do you want to require if someone wants to cut the trees in your park, it is a typical question in WTA techniques but it also a typical question to ignore ownership cost completely and only to think about the ownership benefit, because if you really give a park to a person, he needs to cost a huge money on purchasing plant fertilizer and watering the trees everyday and spend much time to take care of the park first.

In CV method, both WTP and WTA, considered ownership conditions in an extremely complex way, WTP theory considers ownership at the viewpoint of pure public goods while WTA as pure private goods, and economists argued and reached a consensus of quasi-public goods. Although a clear ownership is the basis of trading activities in economic, but the difficulty in environment management research is that nobody can divide the ownership and to conclude the ownership cost and benefit of

quasi-public goods clearly; And we cannot think about ownership cost and benefit at the same time in environmental science because nature does not belong to anyone, As we mentioned before, WTA in contingent valuation method leads to big bias because it ignores the ownership cost completely, this has nothing to do with social investigation skills, but the foundation of the ownership theory. To ignore just one aspect is such a bias idea just like WTA, so, in WTS case, a better approach to solve the problem is that both the ownership cost and the ownership benefit will be ignored through the design of the survey research.

### 2.2.3 Classification of human activity in Environmental Economics

Another theory basis in environmental economics is about the evaluation of human activity. In general, the definition of WTP and WTA is that: (WTP) for an improvement of environmental quality and (WTA) of the compensation for renouncing this improvement (Ahlheima & Buchholzb, 2000). In CV method studies, there are four main questions in survey research, WTP: 1.WTP for the improvement of the environment or ecosystem service. 2.WTP for the activity to avoid environmental degradation. WTA: 3.WTA for ceasing the activity to improve the environment. 4.WTA for the degradation of environment. Through the main questions in CV method research, it is extremely clear that WTP is usually for positive activity and WTA is for negative activity, which needs sacrifice of losses (Knetsch, 1997).

In fact, the classification is depended on the evaluation of human behavior. Researches always distinguish people's environmental behavior on the basis of many variables (Schahn & Holzer, 1990), such as experiences and the cognition of the times, when they doing questionnaire design before going to field survey (Willis, 2004). When we consider it as a positive activity to the environment such as Pro-environment behavior or environmental activism behavior (Pichert & Katsikopoulos, 2008), a questionnaire is always designed to ask the WTP of the respondents to test the consistency with economic theory (Diamond & Hausman, 1994), while when it considered to be a negative activity and causes environmental impact (Glasson, Therivel & Chadwick, 2013) such as environmental damage or pollution projects，we usually ask the respondents to get their WTA for the behavior which running afoul of environmental ethic or environmental codes (Sagoff, 2007). While, here a huge blank happens: Just

like most general public goods or general government projects, if the activity cannot say negative or positive exactly, How to valuate those activities? And in those cases, how can we conduct CV method when the influence of the activity is not so unequivocal? Is it possible to employ the CV method if the attribute of the activity is difficult to distinguish? Or in other words, if the activity which affects the environment itself cannot say either positive or negative at all from the viewpoint of now, how to conclude the valuation of those activities and how to conclude the valuation of general public goods which is neither negative nor positive? In nature, there are many human activities neither good nor bad, for example, if the local government wants to build a center park in a city, and there will be many different ways to design the park, is it better to set a grass ground than a lake? Between lake and the grass ground, which one is better to the environment? If standing from the viewpoint of protecting the environment, it will be a difficult question to decide which one is good and which one is bad exactly although there are many ways to do the environmental projects valuation. While this is such a usual problem that each country may meets those kinds of government projects, thus, an attention should be grasped to find a valuation methodology on all the general ecosystem service, government projects, travel resource, historic heritage and many other visible/intangible nonmarket goods. Not only for those which have obvious negative positive differentiation. In those cases, neither WTA nor WTP is suitable, and WTS techniques are a kind of perfect choice to be conducted to valuate the general public goods or general government projects.

## 2.3 Contrast of WTS and WTA

Before introduce the survey techniques of WTS, a contrast of WTS and WTA; WTS and WTP will be discussed in this research.

| Willingness to Sell (WTS) | Willingness to Accept (WTA) |
|---|---|
| **Conditions of Hypothesis:**<br>**A Third-Party Private Goods** | **Conditions of Hypothesis:**<br>**Pure Private Goods** |
| **What will happen after been sold?**<br>**An Ownership Transferred, But Nothing Change for the respondent** | **What will happen after been sold?**<br>**Respondents' Ownership Loss** |
| **What's the consequence of been sold for the respondent?**<br>**Nothing Change for the respondent** | **What's the consequence of been sold for the respondent?**<br>**FROM: Make use as a owner**<br>**INTO: Renounce/Give up** |
| **What's the subsequent activity?**<br>**Temporarily unknown or neither negative nor positive** | **What's the subsequent activity?**<br>**In most cases, there will be negative effect or Personal Benefits Loss** |

**Figure 3. Contrast List of WTS and WTA**

Although some researches they called WTA as WTS sometimes because a transfer of ownership occurred in WTA cases, such as the questionnaire to ask the hunters about their willingness to accept to give up hunting (Hammack & Brown, 1974), while it's not so similar with sales behavior (Miller, 1964), it's much closer to the acceptance for renouncing the ownership (Tietenberg, 1974), that's why it is called WTA rather than WTS in most of the studies; and Figure 3. shows the differences clearly.

## 2.4 Contrast of WTS and WTP in economics utility models

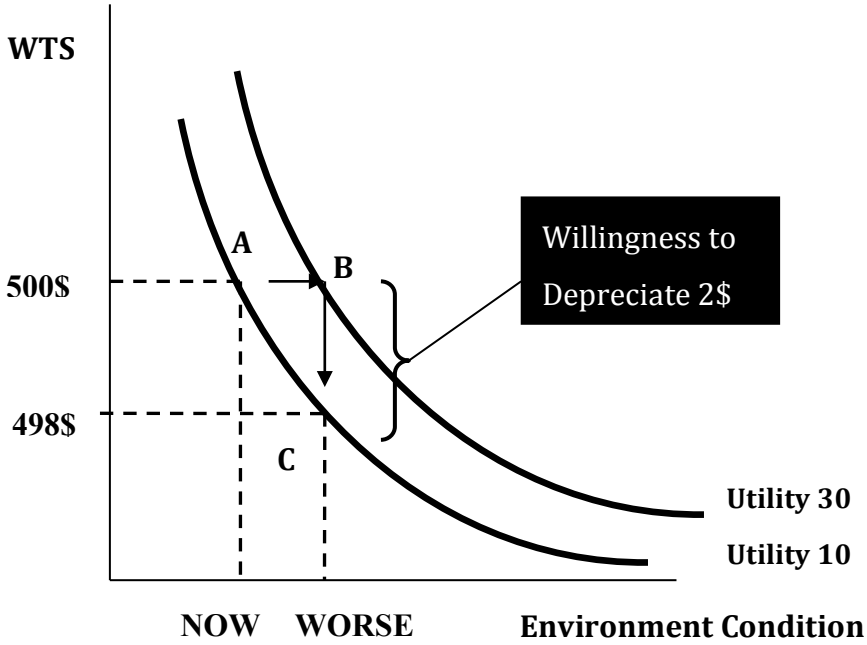



**Figure 4. Indifference Curve of Utility in Willingness to Sell**

Compared with WTP, an important value in WTS is called Willingness to Depreciate (WTD), it means after the environment conditions become worse, how much can be depreciated of willingness to sell value. Although they use the same economics model, WTS is free from the external factors like income level in WTP. Figure 5. shows the theory foundation of WTD through the indifference curve of utility but with no external factors, and if WTD techniques are well conducted, it will be more objective than WTP in theory. While in this research, the WTD theory is just built and mentioned, the techniques of WTD have not been deeply conducted yet.

## 2.5 Question design and survey techniques of WTS

From now on, the survey techniques and question design will be introduced.

In order to make the question design easy to understand, a simple valuate target

will be an example: a tree. The typical question of WTP is: How much would you like to pay to protect this tree/ to make the tree looks better? The typical question of WTA is: If the tree is yours, How much would you like to accept if it will be cut down? While in WTS case, there is some extremely important survey tips: Never try to describe like this "Imagine if you are a salesman of an environment company, and all the nature recourses in this world are belong to this company… "; Although the theory foundation is called Distributer Theory, never try to ask respondents to think as salesmen because it will be too complex and difficult to understand for the general public. Usually, the rule of social survey is that it should be EASY to understand, especially if the survey respondents are general public, try to make the question easier and easier. So, in this research, the WTS question is designed into: If the tree belongs to your friend A, and friend A wants to sell it to your friend B, How much can be sold according to your personal preference? (Investigator must stress on both A and B are respondent's friends; this suppose is very important because it makes respondent a third-party stance, and think the problem standing out of personal losses and benefits.) Of course, in other different cases, different questions can be designed, AS LONG AS, to make respondents ignore ownership cost and ownership benefit at the same time. This is the key essence principle in WTS survey design.

## 2.6 Details of the research objectives

After the comprehensive understanding of WTS theory, the details of the objective of this research will be shown:

(1) Compute the contractive value of WTP, WTS and WTA; **(WTP<WTS<WTA).**

(2) Verify the piu-objectivity of WTS compared with WTP and WTA.

(3) Conclude the limitation of WTP, WTS and WTA in the economic valuation application.

(4) Compute a economic value of ecosystem service project which is much closer to the real market.

(5) Offer an advisable financial value support for local government of doing Strategy Environment Assessment.

# 3 Methodology

## 3.1 Contrastive Research Method.

In order to test the value of WTP, WTA and WTS, a contrastive research method must be employed, thus, testing WTP, WTA, and WTS on the same target project at the same time is extremely important to find out the differences among the three values and to do the value analysis of regularity and universality.

## 3.2 Incorporative Market Method

Figure 5. shows how the incorporative market method works. By conducting the absolutely same techniques of WTP, WTS and WTA into two different projects, and finally, a comparative valuation results analysis will be done between the two different projects.

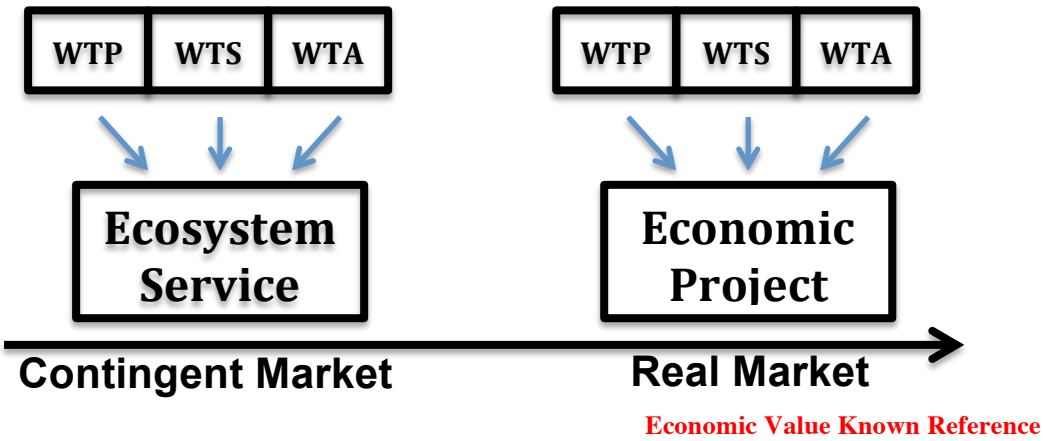



**Figure 5. Incorporative Market Method Model**

Left side is the valuate target and right side is an economic value known finished project as a reference. Before doing valuation of the target project, a finished value known project need to be chose first, and here are some principles of how to choose the reference project: 1.) Economic value knowable; 2.) Projects Period; 3.) Projects region; 4.) Projects scale; 5.) Social familiarity; 6.) Social recognition. Of course it is impossible to find two absolutely same projects, but by considering the

6 aspects, a similar level project can be chose as a reference, while a pre-survey maybe necessary when deciding the reference project.

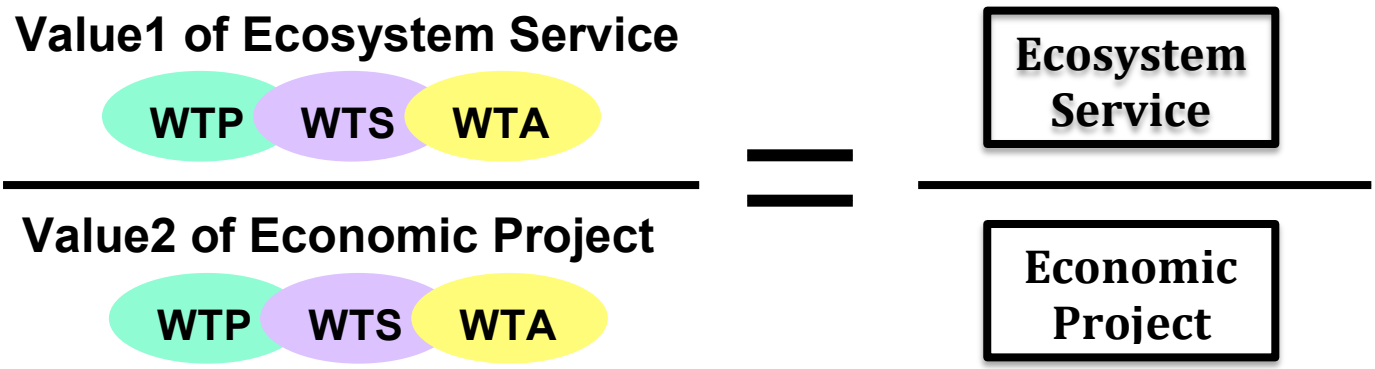



**Figure 6. Computational Method of Value**

Figure 6. shows the computational method of the value, after testing the value1 and value 2, the value of an Ecosystem Service can be concluded through a known quantity through a finished project, because the value of an economic project can be computed exactly employing the economics method. What researchers should do is to choose a quantity known reference project and then get the value1 and value2.

# 4 Research Site

## 4.1 Introduction of Amoy City

In this research, the research site is Amoy city in Fujian Province in China. The city land area is **1573.16km²**; Average temperature is **18.5°C ~ 25.4 °C (2014)**
; Annual precipitation is **1663.1mm (2014)**; Resident population is **3,730,000 (2013)**.

The reasons why Amoy city is selected are:

(1) Amoy city pays high attention to the city planning and Strategy Environment Assessment.

(2) Amoy city is very famous for its tourist resources and holds a national fame of livable city and with good weather and nature environment.

(3) Amoy city implements many general government projects and new planning, with excellent plan publicity; and local government pays attention to public participation.

So, cities like Amoy is the best choice to test WTS valuation method, not for environment damages or environment protecting, just for valuating general city planning and general public goods.

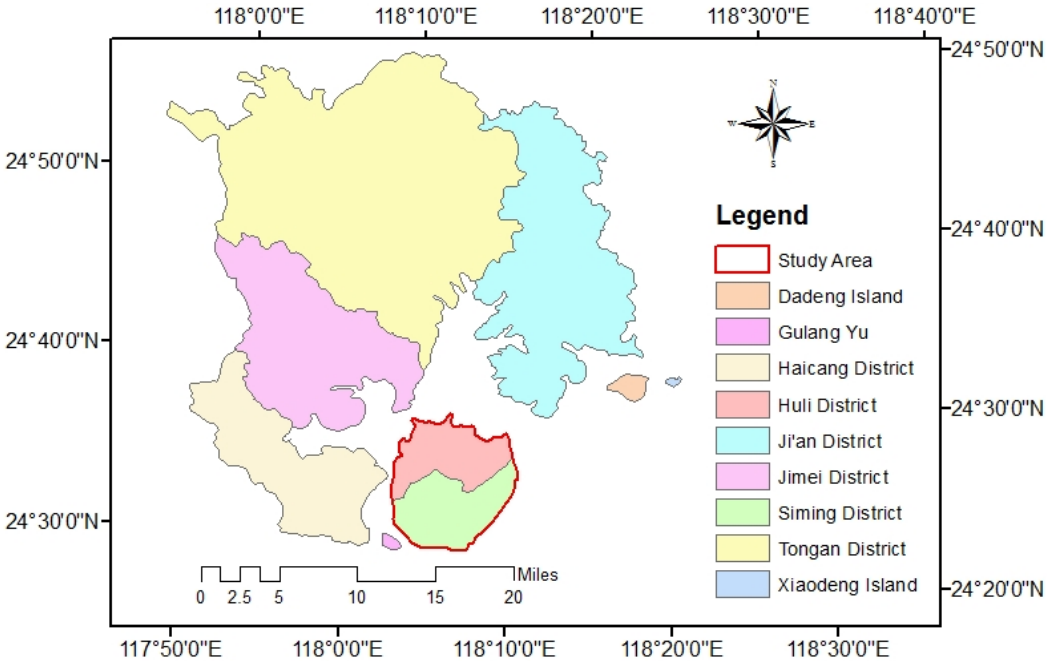



**Figure 7. Research site: Map of Amoy City**

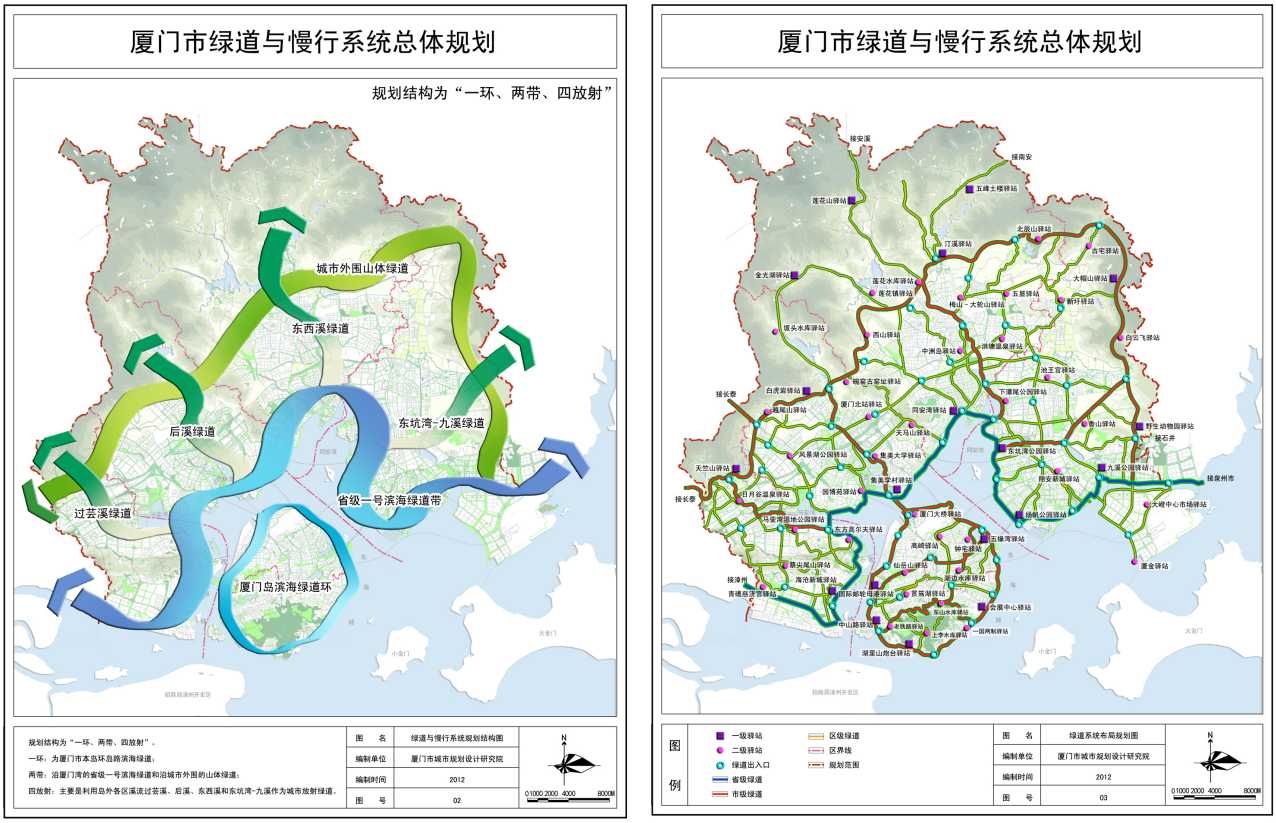



**Figure 8. The Circular Green Road System Plan of Amoy City**

**XIAMEN MUNICIPAL COMMISSION OF URBAN PLANNING:**

**http://www.xmgh.gov.cn/zwgk/ghcg/201305/t20130528_28364.htm**

Figure 8. shows the planning of the Circular green road, the valuate target project is chose here, a new greenway planning in Amoy Circular Road.

## 4.2 Introduction of the study area: New challenge of Amoy Circular Road

Circular Road: Road by the sea which green width is over 50 meters. And table 1. Shows the details of the information of Circular Road

**Table 1. Details of the Index of Circular Road**

| |
|---|
| **Coastline Length: 43km， width： 44-60km** |
| **Motor drive path: 18-24m** |
| **Bike path: 6-7m** |
| **Walking path: 6-8m** |
| **Full length of tourism resource: 39km** |
| **Green belt: 80-100m** |
| **Total area of green： 47ha** |
| **History investment: 3,800,000,000¥** |

Amoy Circular Road is working as urban traffic roads, tourism recourses and urban green area at the same time. From 2012, the government set a new goal to make Circular Road an international tourism coastline, and until now many different kinds of small projects are carrying out every year; such as (1) part rectification projects; (2) improve facilities projects; (3) new landscaping projects. In this research, on the basis of the public information of the government's planning on the website, a green road part improvement project is chose.

This project planning (see figure 9.) has two main parts:

1. Architectural Planning of the Greenway Leisure Inn
2. Architectural Planning of the Greenway Area


**Figure 9. Two Main Parts of the Project Planning**

Amoy Bay Park is chose as the reference project because it has a similar economic value level in planning, and the investment in economics of Bay Park is **170,000,000 ¥.** (This value is only known for researcher, and the respondents will not be told this economic value of the Bay Park when conducing field survey.)

# 5 Field Survey

In this research, respondent self-administered survey has been avoided. Interview/ Visit survey is chose as the investigation method, and the investigator will directly inquiry the respondents after strict guidance. It took about 20~30 minutes per respondent to finish the survey.

A details of the planning with many pictures have been printed and the investigator showed the printed planning and pictures of the projects, and then started using continuous verbal introductions until the respondents understood about the CV method, and finally asked them to answer the questions. And all the data is filled by investigator.

In this field survey research, Non-probability sampling is chose, by using quota sampling (sex, age) and convenience sampling combined method, to conduct the interview survey.

## 5.1 Survey site and Time Schedule:

1.2015.7.17~7.18 Pre-survey randomly.
2.2015.7.19~7.22 Amoy Circular Road.
3.2015.7.23~7.25 Amoy Bay Park.
4.2015.7.26~7.28 Xiamen University. (Xiamen University is also located in Circular Road)

## 5.2 Field Survey Result

As a result, 69 persons in total have been interviewed. (See Table 2.)

**Table 2. Field Survey Respondents**

| Total: 69 | Male | Female |
|---|---|---|
| Amoy Circular Road | 22 | 16 |
| Amoy Bay Park | 19 | 12 |

**Table 3. Index of Correlation Analysis of the Respondents**

| | Amoy Circular Road | Amoy Bay Park |
|---|---|---|
| Live in Amoy or not | 50% Local | 67.7% Local |
| Access frequency | 42.1%<5/Year;<br>5/Year<10.5%<10/Year<br>10/Year<15.8%<20/Year<br>31.6%>20/Year | 38.7%<5/Year;<br>5/Year<32.3%<10/Year<br>10/Year<29.0%<20/Year |
| Purpose of visit | 94.7% Leisure, Travel<br>2.6% Business<br>2.6% Others | 96.8% Leisure, Travel<br>3.2% Others |
| Visit companion | 42.1% Friends<br>39.5% Family<br>13.2% Mate<br>5.3% Oneself | 45.2% Family<br>29.0% Mate<br>22.6% Friends<br>3.2% Oneself |
| Importance of the area | 97.4% Extremely important<br>2.6% General important | 77.4% Extremely important<br>22.6% General important |
| Satisfaction of the area | 23.7% Very satisfied<br>71.1% General satisfied<br>2.6% Not so satisfied<br>2.6% Not satisfied | 45.2% Very satisfied<br>48.4% General satisfied<br>6.5% Not so satisfied |
| Age | 16~45 | 14~46 |
| Sex | Male:57.9% Female:42.1% | Male:61.3% Female:38.7% |
| Job | 26.3% Company employee<br>26.3% Student<br>23.7% Private owner<br>13.2% National institutions<br>5.3% No job<br>5.3% Others | 35.5% Student<br>22.6% Company employee<br>19.4% Private owner<br>16.1% National institutions<br>6.5% No job |
| Education level | 63.2%University<br>21.1%Master and PHD<br>10.5%Senior high school<br>2.6%Junior middle school | 54.8%University<br>19.4%Skills school<br>9.7%Master and PHD<br>9.7%Senior high school |

| | | |
|---|---|---|
| | 2.6%Skills school | 6.5%Junior middle school |
| Income | 18.4%<2000<br>2000<23.7%<5000<br>5000<36.8%<10000<br>21.1%>10000 | 48.4%<2000<br>2000<35.5%<5000<br>5000<16.1%<10000 |

Table 3. is all the personal index of the respondents; in this research, 1.) Local Amoy citizen or not; 2.) Access frequency; 3.) Purpose of visit; 4.) Visit companion; 5.) Importance of the target place; 6.) Satisfaction of the target place; 7.) Age; 8.) Sex; 9.) Job; 10.) Education level; 11.) Income level. correlation survey questions are conducted.

# 6 Data Analysis and Discussion

## 6.1 Value of WTP, WTS and WTA

**Table 4. Amoy Circular Road Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| WTP | 38 | 0 | 3,000 | 393.82 | 597.725 |
| WTS | 38 | 500,000 | 3,000,000,000 | 277,197,368.42 | 569,423,371.912 |
| WTA | 38 | 1,500,000 | 50,000,000,000 | 2,086,684,210.53 | 8,096,399,144.082 |
| Valid N(listwise) | 38 | | | | |

**Table 5. Amoy Bay Park Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| WTP | 31 | 5 | 1,000 | 130.48 | 240.819 |
| WTS | 31 | 500,000 | 1,000,000,000 | 103,580,645.16 | 192,417,518.986 |
| WTA | 31 | 1,000,000 | 2,000,000,000 | 428,161,290.32 | 489,878,222.743 |
| Valid N(listwise) | 31 | | | | |

Table 4. shows the descriptive statistics value of WTP, WTS and WTA of Circular Road and Table 5. is the value of Bay Park. Construction Department of Amoy concluded a economic investment value of Bay Park about 170,000,000 Chinese yuan, and after checking the WTP, WTS and WTA values of Bay Park, the WTS value 103,580,645.16 is the closest value to the real economic investment.

## 6.2 Correlation Discussion

### 6.2.1 Income

**Figure 10. Circular Road WTP & Income Level**

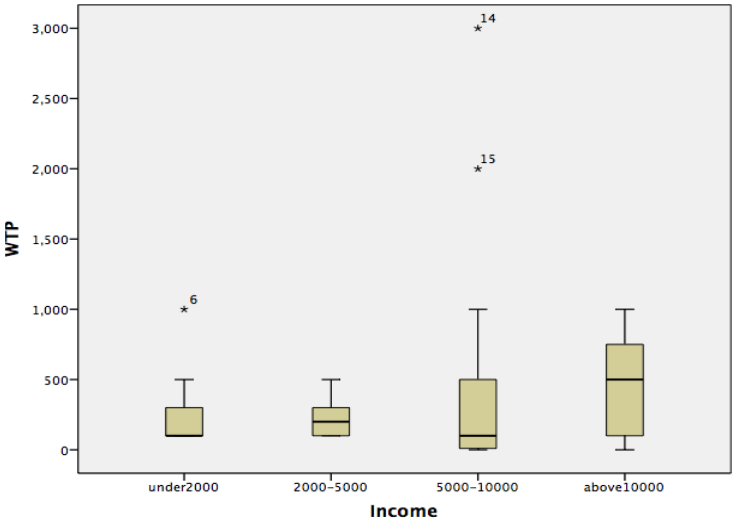



**Figure 11. Bay Park WTP & Income Level**

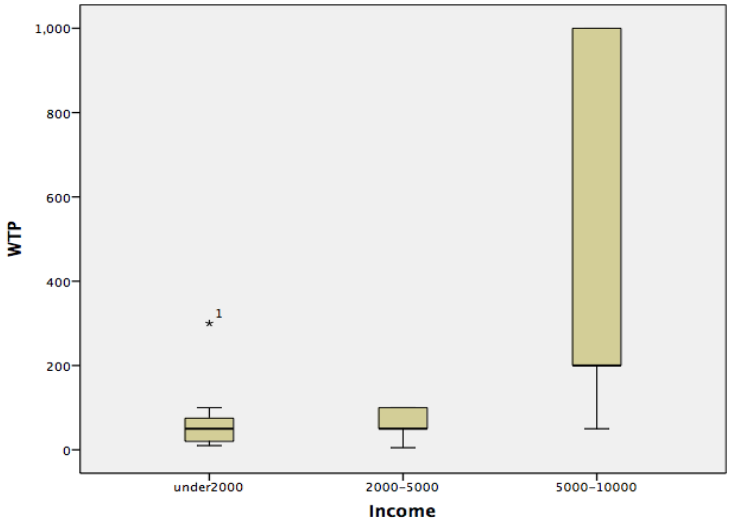



**Figure 12. Circular Road WTS & Income Level**

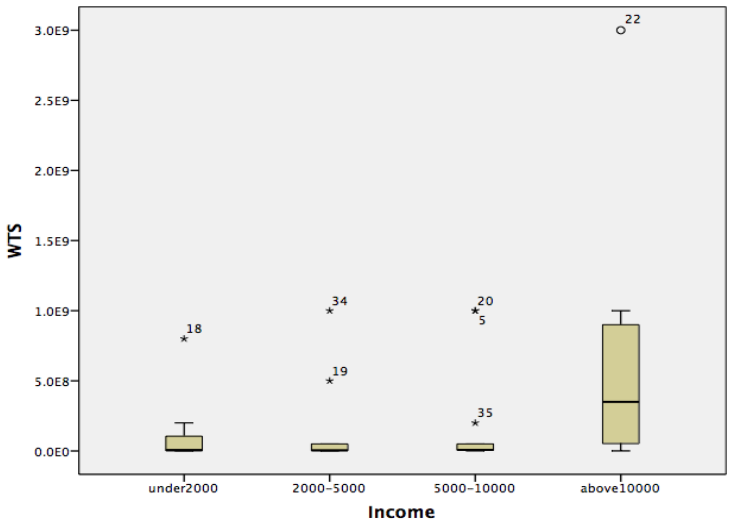



**Figure 13. Bay Park WTS & Income Level**

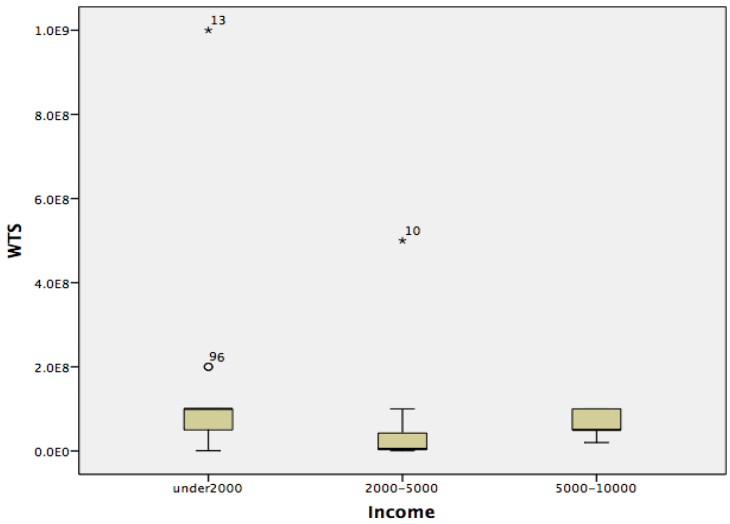



**Figure 14. Circular Road WTA & Income Level**

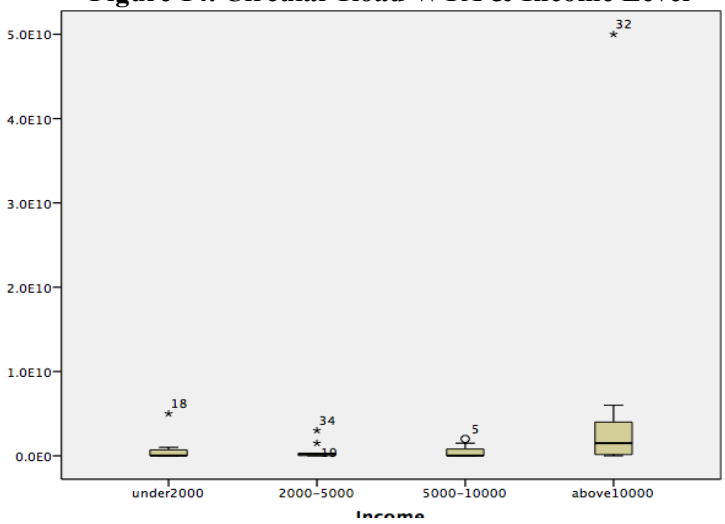
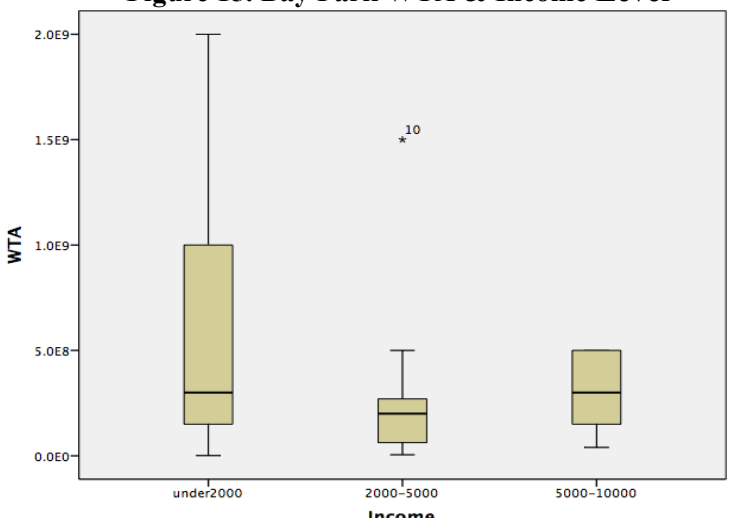



**Figure 15. Bay Park WTA & Income Level**



The first correlation analysis is about income level, and the WTP value of both Circular Road case and Bay Park case show extremely clearly that WTP has a positive correlation with personal income level. Thus, people who have a higher income level are more likely to pay more for the environment/ public service.

While, the relationship between WTS value and income level is not so clear. See the Circular Road WTS & Income figure, the highest WTS value of each income level is almost the same, in other words, people can valuate the public service based on their thinking and this WTS thinking is independent of income level. Bay Park WTS & Income figure also shows an almost equal WTS value of different income levels.

It is important to see the Circular Road WTS & Income figure again, the above 10000 Chinese yuan income people are likely to valuate the environment high, and it is obvious in figure Circular Road WTS & Income. But the WTS value really don't have a incremental relationship with income level; only over 10000 Chinese yuan people are considering environment worth more.

The highest WTA value of Circular Road of each income level is almost the same and it is likely no obvious positive relationship with income level. While, see figure Bay Park WTA & Income, the WTA value of income under 2000 Chinese yuan is much higher than the others, in other words, in Bay Park case, people with poor income level are more likely to claim more for compensation.

### 6.2.2 Education Level

**Figure 16. Circular Road WTP & Education**

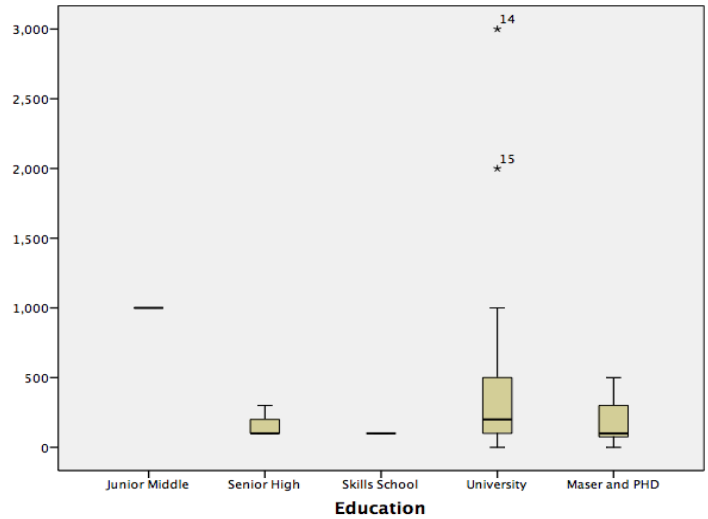



**Figure 17. Bay Park WTP & Education**

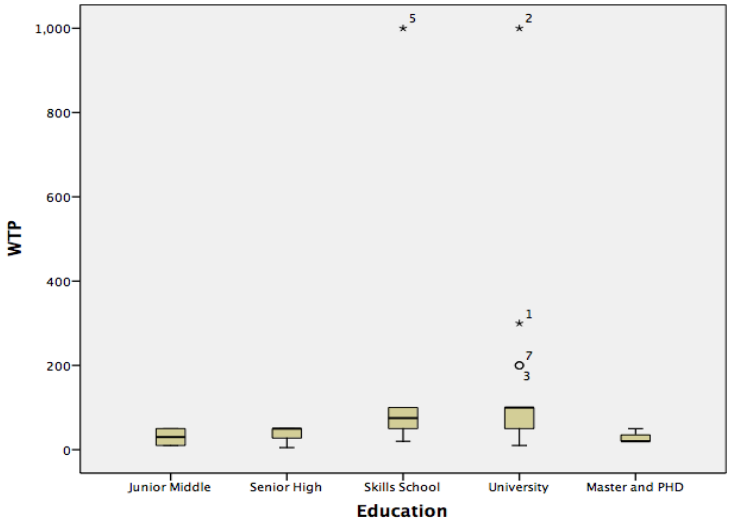



**Figure 18. Circular Road WTS & Education**

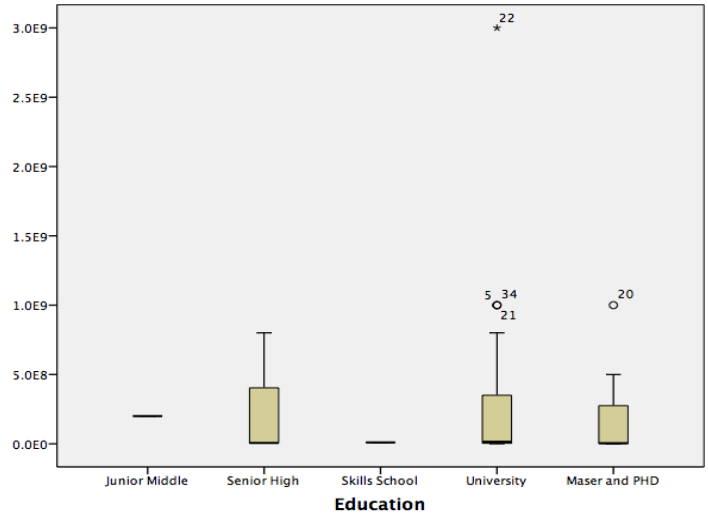



**Figure 19. Bay Park WTS & Education**

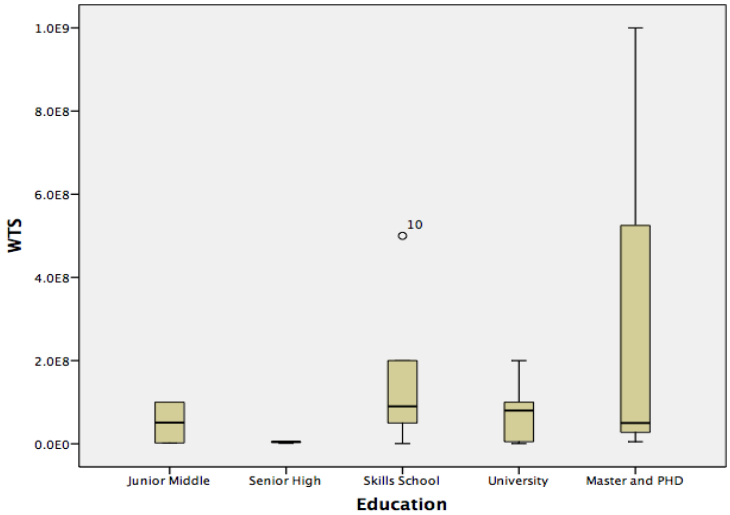



**Figure 20. Circular Road WTA & Education**

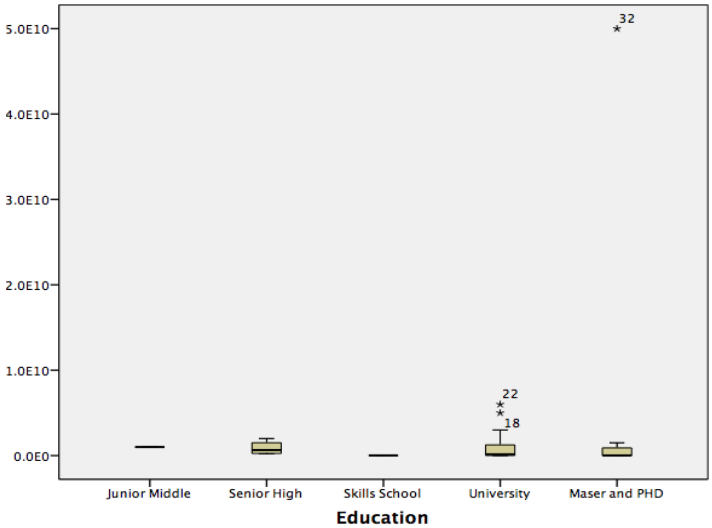
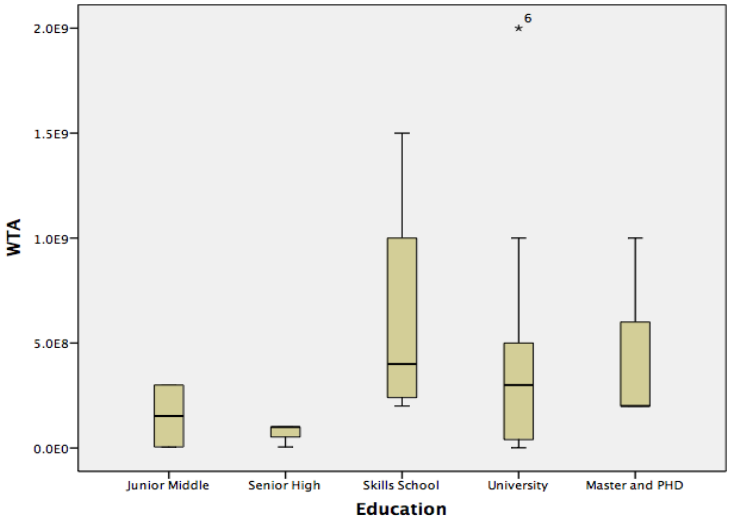



**Figure 21. Bay Park WTA & Education**



The second correlation analysis is about education level, and the WTP value of both Circular Road case and Bay Park case show a fuzzy positive correlation with education level. But the through the tendency, people with higher education level are more likely to pay more; while compared with income level, the influence of education level is smaller. Both Circular Road case and Bay Park case, the university educated people would like to pay the most money.

In Circular Road WTS & Education figure, the university and Mater/ PHD educated people are likely to valuate the environment higher, and in Bay Park WTS & Education figure, it is extremely clear that Master/ PHD educated people valuate the environment the highest. It seems like people with higher education would like to valuate environment more money, and people with higher education level can help them keep a good understanding during answering the survey questions; they can understand the projects introductions better and understand the CV method questions better.

The WTA value of both Circular Road case and Bay Park case did not show an obvious correlation with education level. In Bay Park case, skilled school educated people require the most money for compensation.

### 6.2.3 Job

**Figure 22. Circular Road WTP & Job**

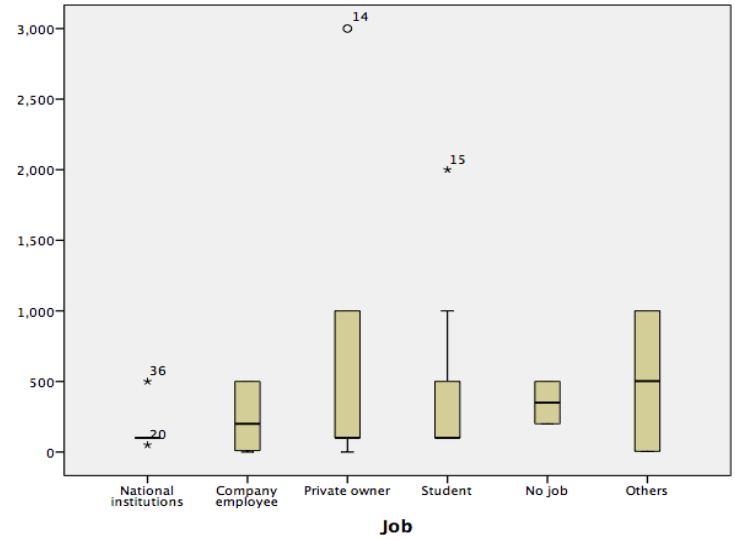



**Figure 23. Bay Park WTP & Job**

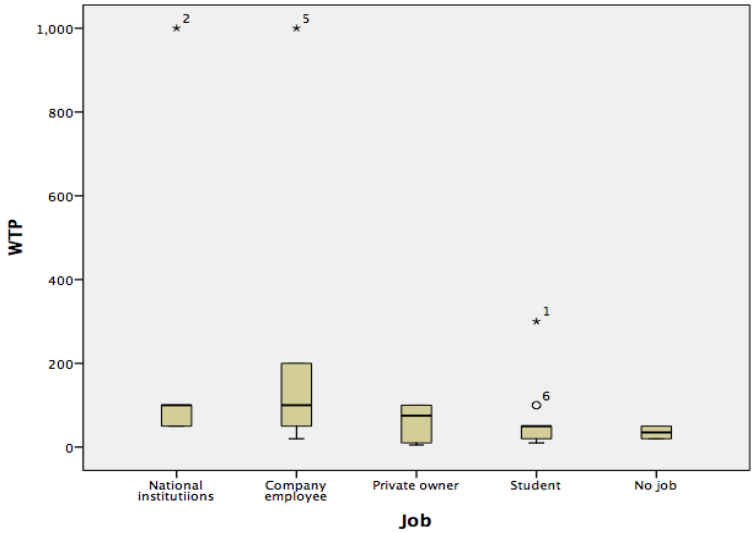



**Figure 24. Circular Road WTS & Job**

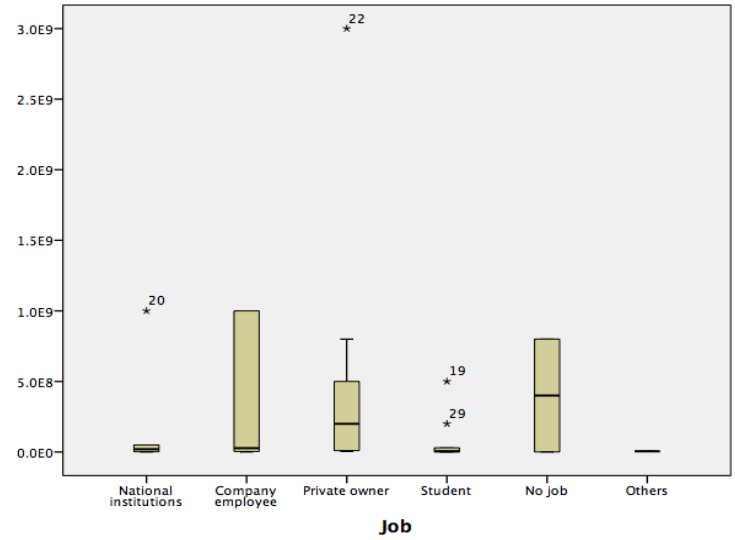



**Figure 25. Bay Park WTS & Job**

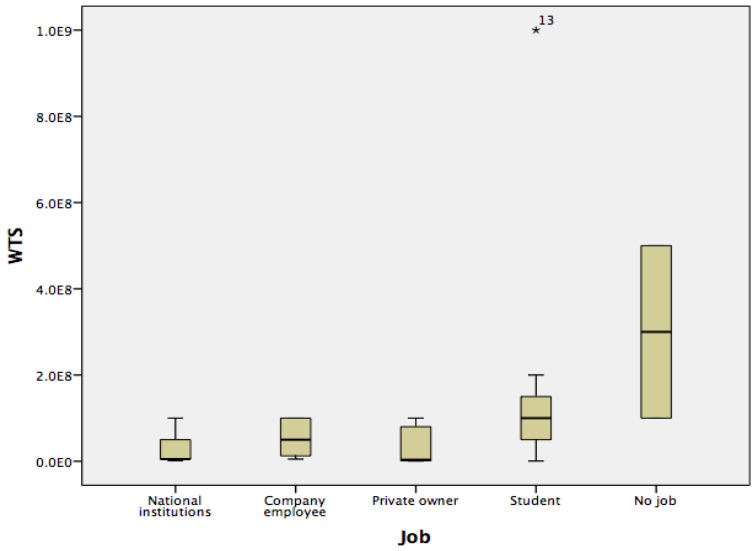



**Figure 26. Circular Road WTA & Job**

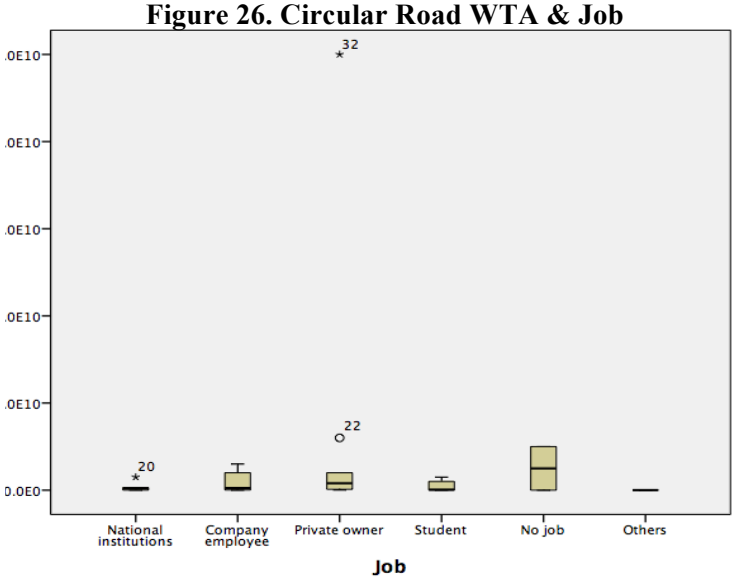
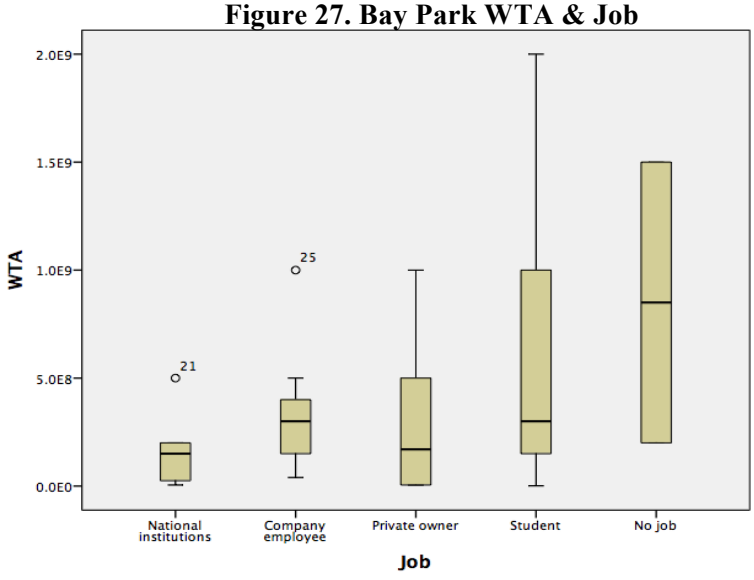



**Figure 27. Bay Park WTA & Job**



The third correlation analysis is about different jobs, in Circular Road case, people working for national institutions would like to pay the less money even compared with no job people. And in Bay Park case, no job people pay the less.

See figure WTS & Job of Circular Road case, company employees, private owners and no job people valuate the environment higher price. And in Bay Park WTS & Job figure, no job people valuate the environment the highest.

See the WTA & Job figure, in both Circular Road and Bay Park case, national institutions people require the less money and no job people require the most money, and in Bay Park case, student also require more money than working people.

### 6.2.4 Sex

**Figure 28. Circular Road WTP & Sex**

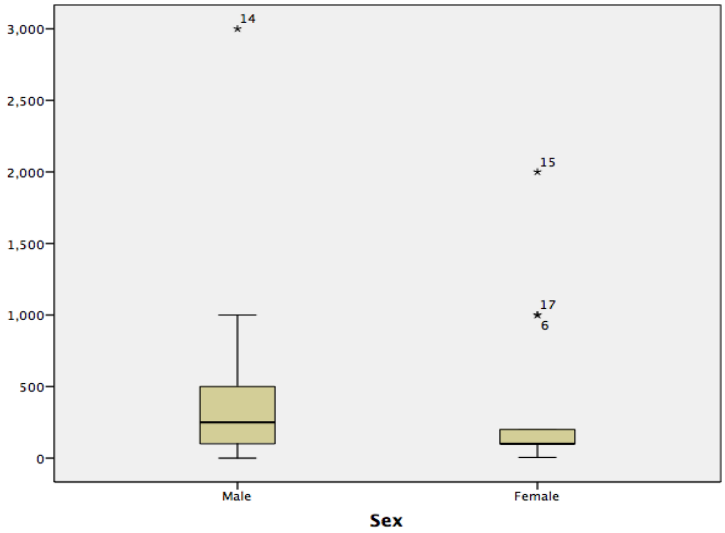



**Figure 29. Bay Park WTP & Sex**

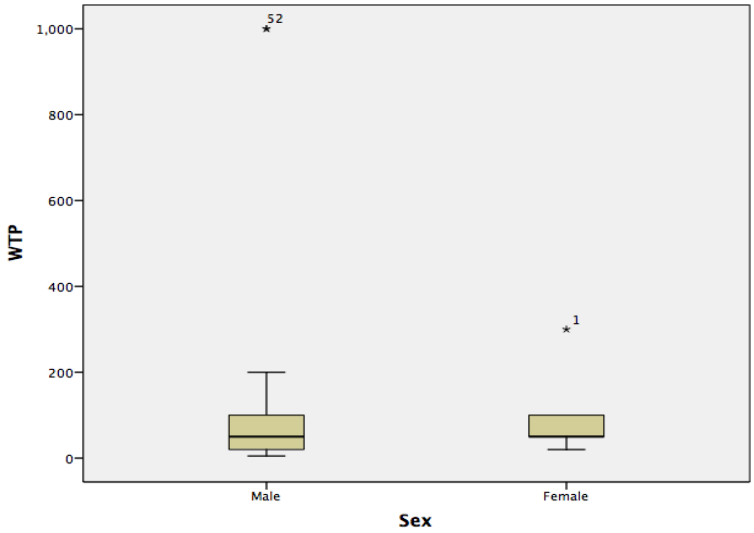



**Figure 30. Circular Road WTS & Sex**

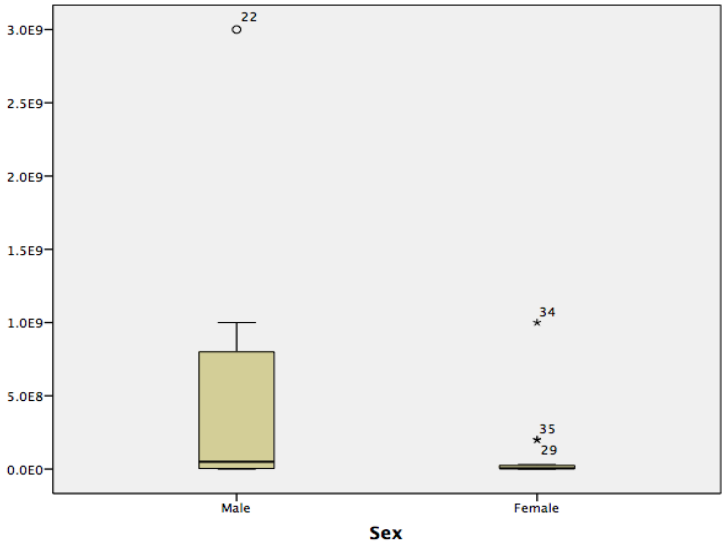



**Figure 31. Bay Park WTS & Sex**

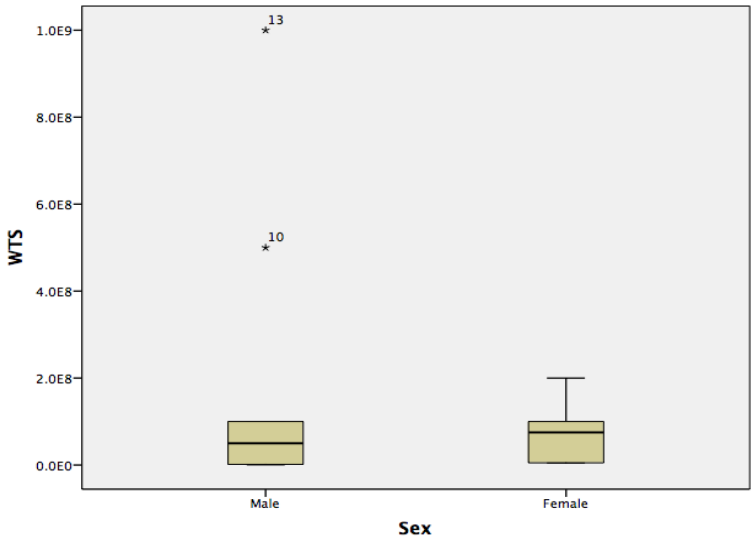



**Figure 32. Circular Road WTA & Sex**

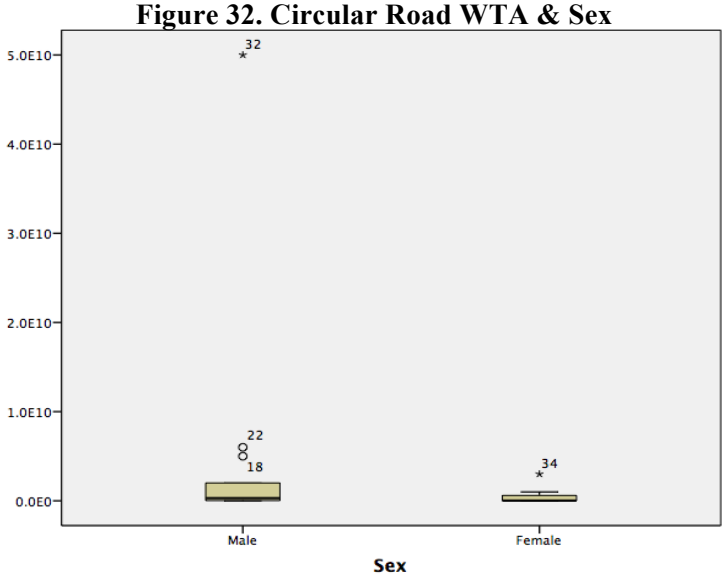
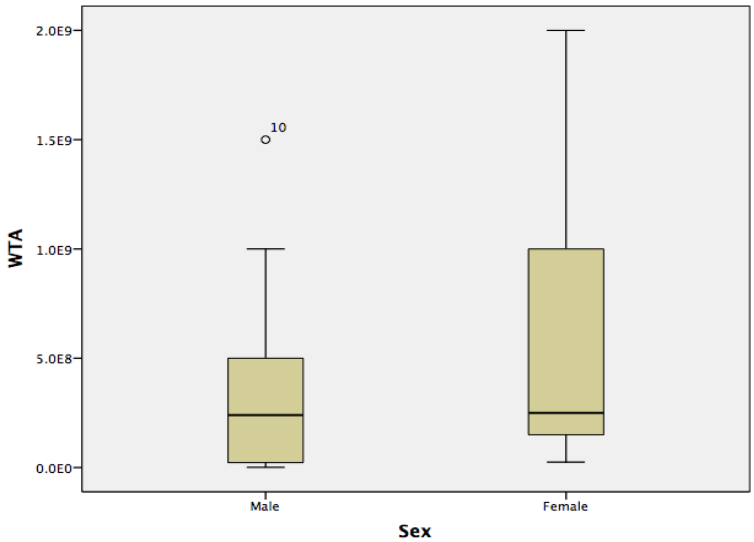



**Figure 33. Bay Park WTA & Sex**



The forth correlation analysis is about sex, in both Circular Road and Bay Park case, men would like to pay more for environment than women.

In Circular Road WTS & Sex figure, men are more likely to valuate environment and public services higher than women, and in Bay Park case, men and women are about same level.

In Circular Road WTA & Sex figure, men require more money than women; but, in Bay Park case, women require obvious much more than men, the reason of this huge change figure is that, usually women take their children to the Bay Park to spend a whole afternoon, Bay Park seems like a good place for women to take care of their children, so Bay Park maybe means more important for women.

### 6.2.5 Age

**Figure 34. Circular Road WTP & Age**

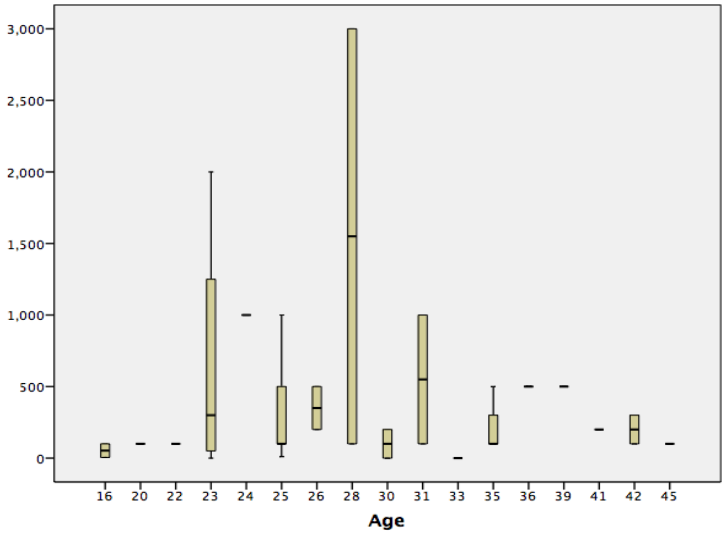



**Figure 35. Bay Park WTP & Age**

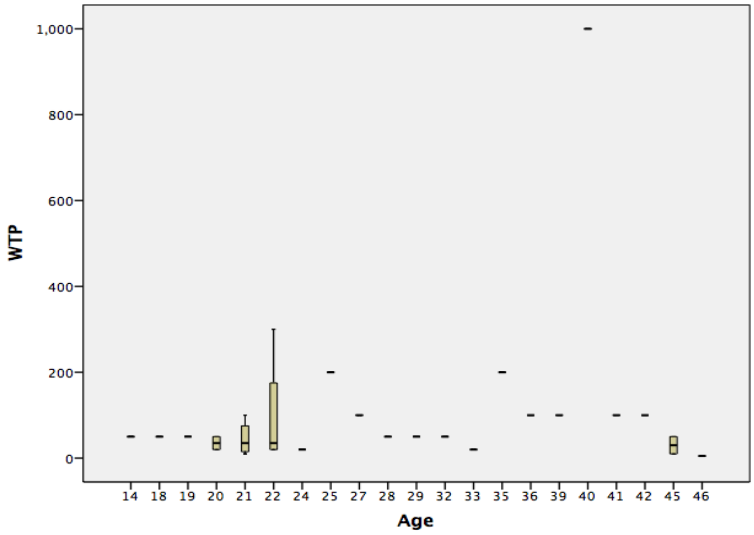



**Figure 36. Circular Road WTS & Age**

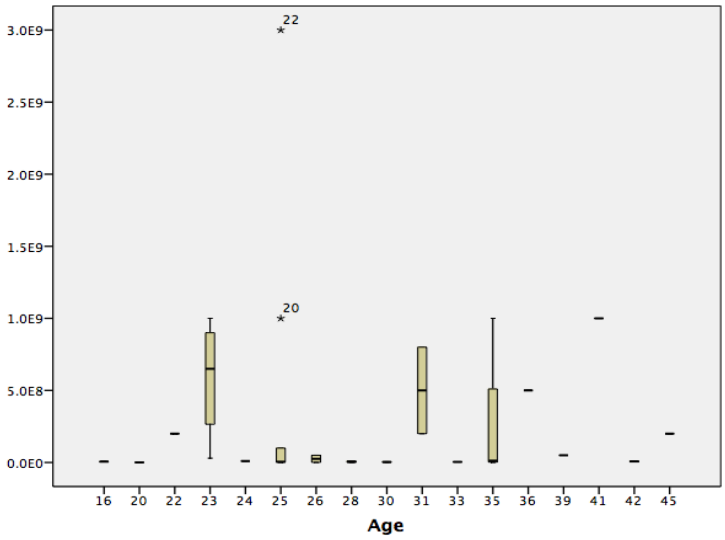



**Figure 37. Bay Park WTS & Age**

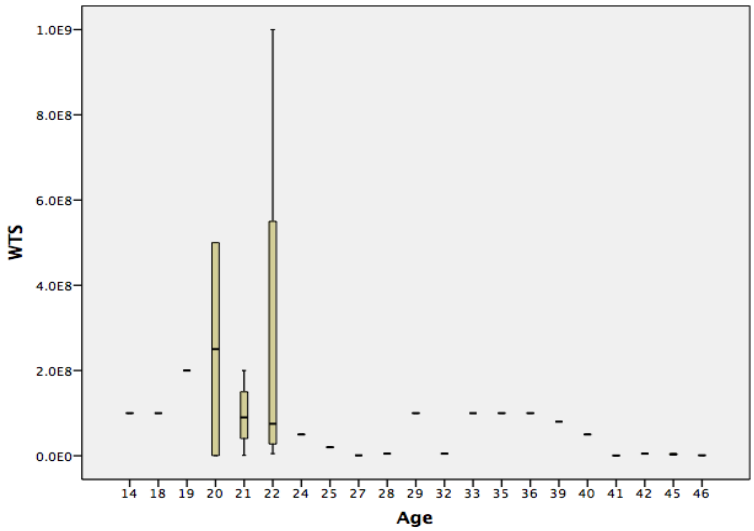



**Figure 38. Circular Road WTA & Age**

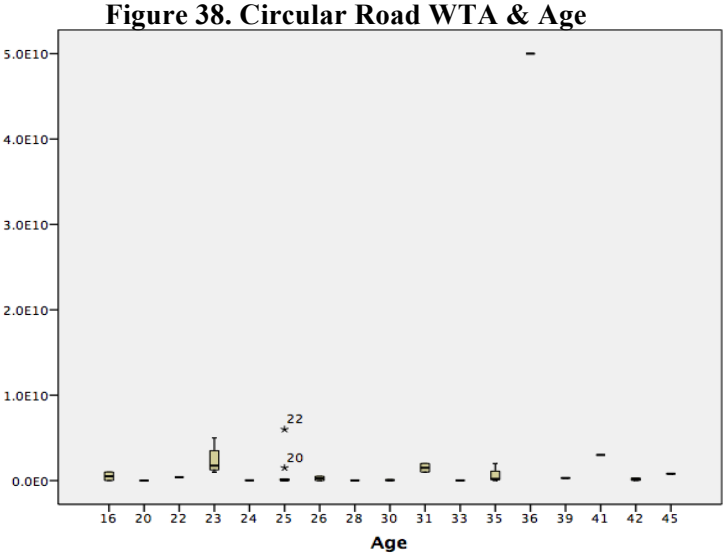
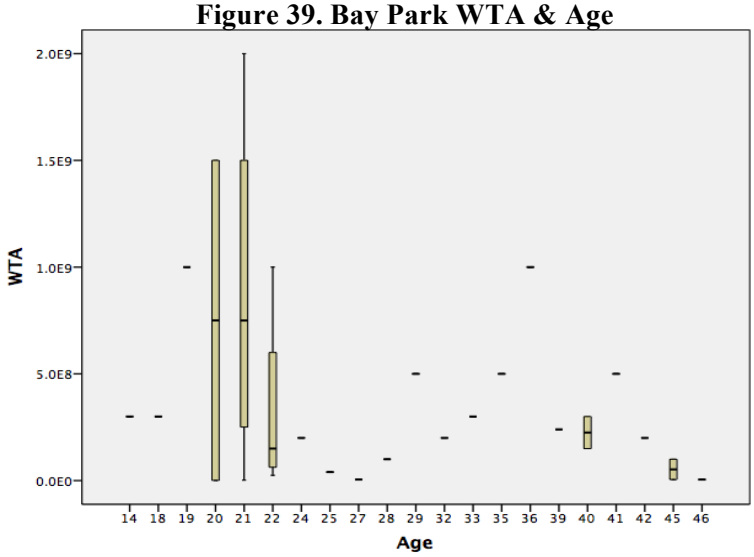



**Figure 39. Bay Park WTA & Age**



The fifth correlation analysis is about age, in both Circular Road and Bay Park case, 20's year old and 30' s year old people are likely to pay more for environment, compared with other younger people or elder people.

In Circular Road WTS & Age figure, people of 23 years old and 30's year old people valuate the environment higher, and in Bay Park case, only people around 20 years old valuate environment and public services high.

See both figure of WTA & Age of the two cases, people around 20 years old require the most money for compensation.

### 6.2.6 Local people or not

**Figure 40. Circular Road WTP & Local or not**

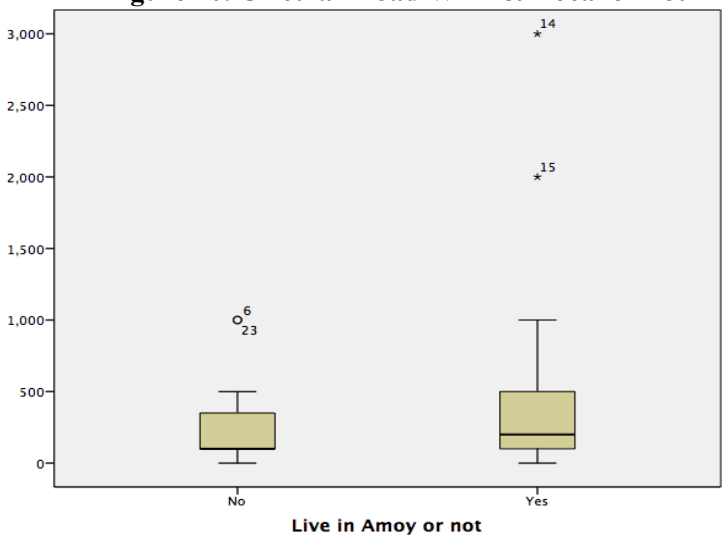



**Figure 41. Bay Park WTP & Local or not**

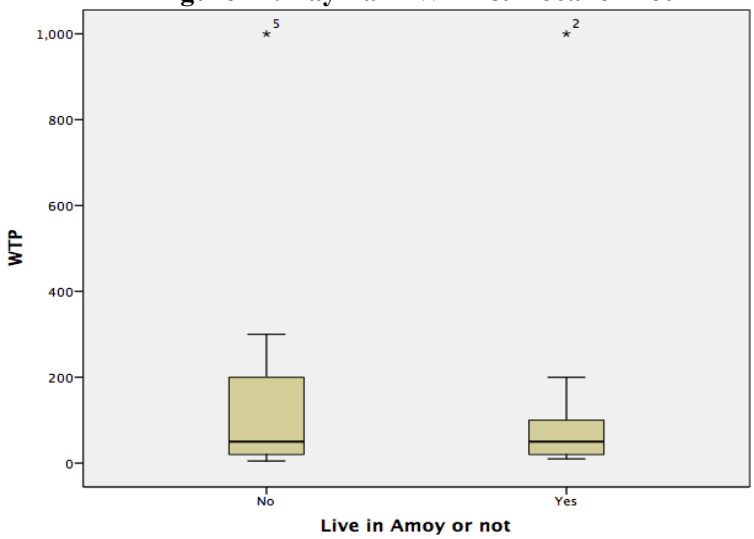



**Figure 42. Circular Road WTS & Local or not**

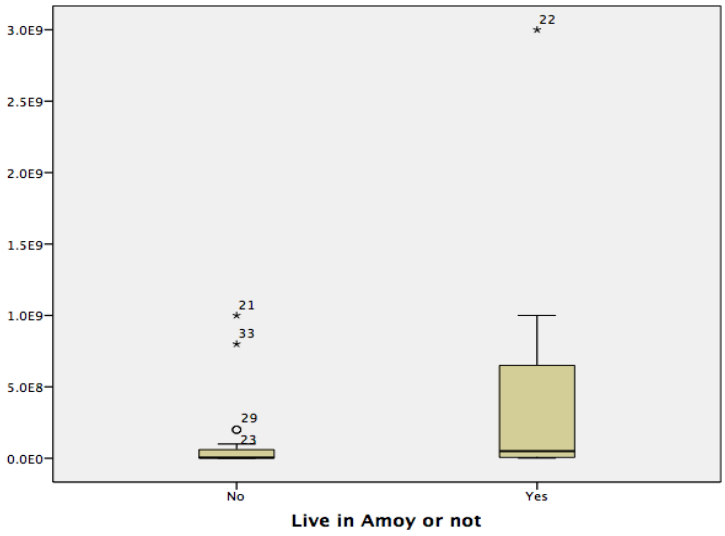



**Figure 43. Bay Park WTS & Local or not**

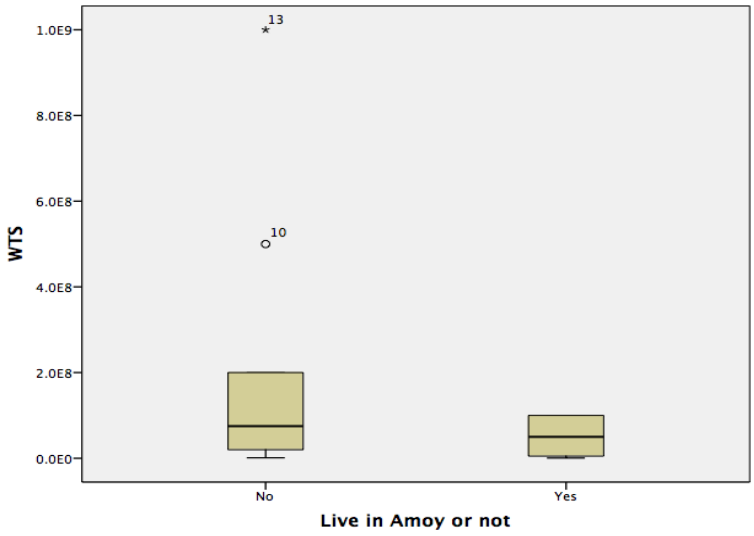



**Figure 44. Circular Road WTA & Local or not**

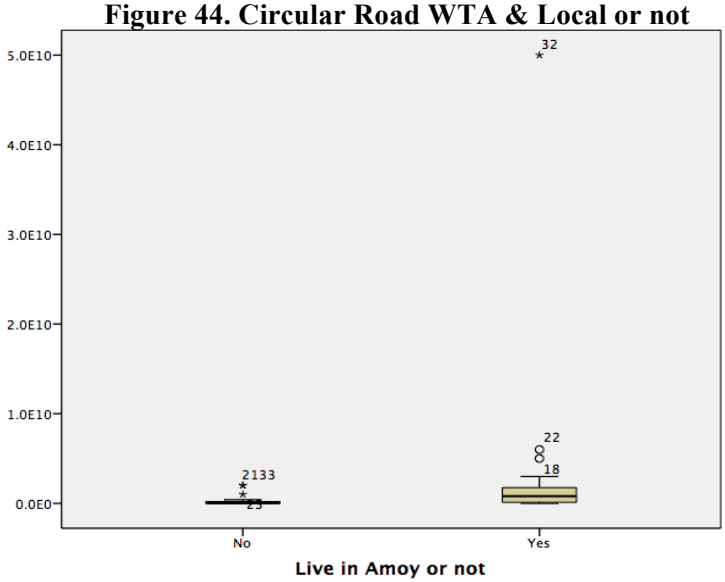
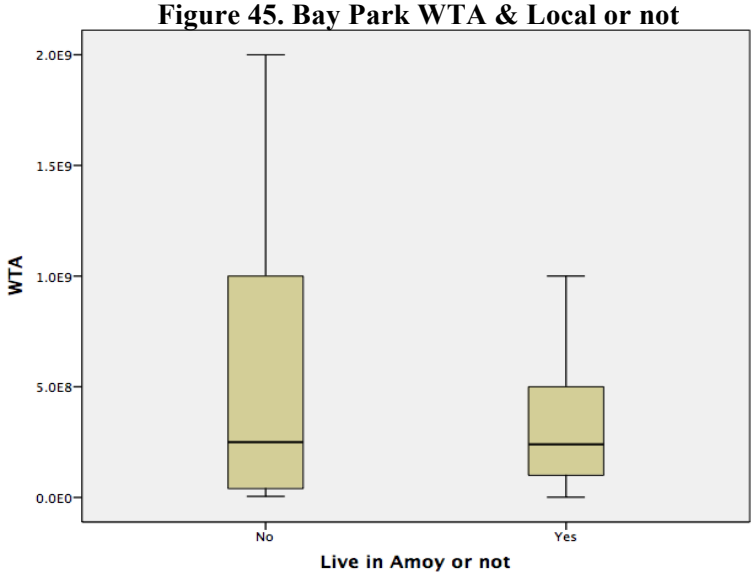



**Figure 45. Bay Park WTA & Local or not**



The sixth correlation analysis is about whether they live in Amoy or not , in Circular Road case, Local people would like to pay more money for environment and public services than travelers. While in Bay Park case, travelers would like to pay more than local people.

See figure Circular Road WTS & Live in Amoy or not, it is extremely clear that Local people are more likely to valuate the environment high because they are knowing the place better than travelers. While in Bay Park case, travelers are valuating the environment higher.

In figure Circular Road WTA & Live in Amoy or not, Local people require more money than travelers and Bay Park is opposite again.

### 6.2.7 Access Frequency

**Figure 46. Circular Road WTP & Access Frequency**

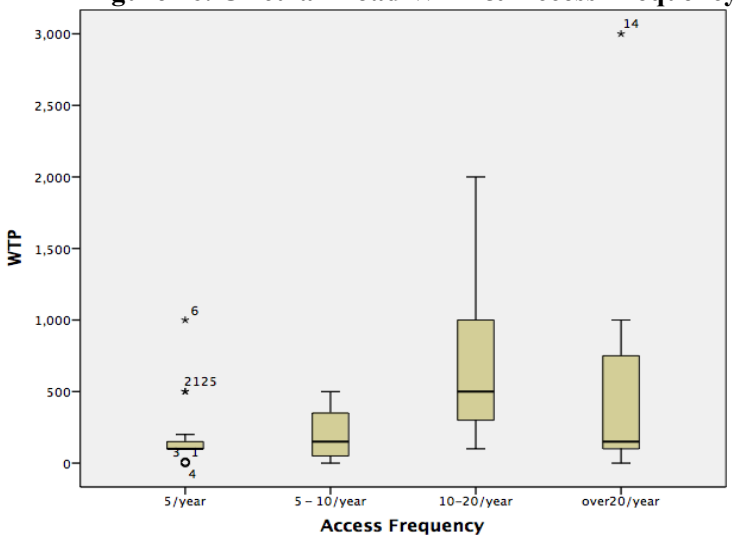



**Figure 47. Bay Park WTP & Access Frequency**

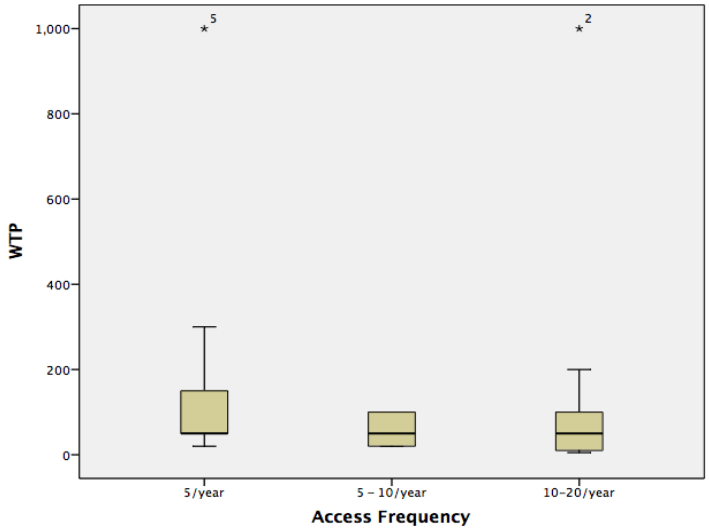



**Figure 48. Circular Road WTS & Access Frequency**

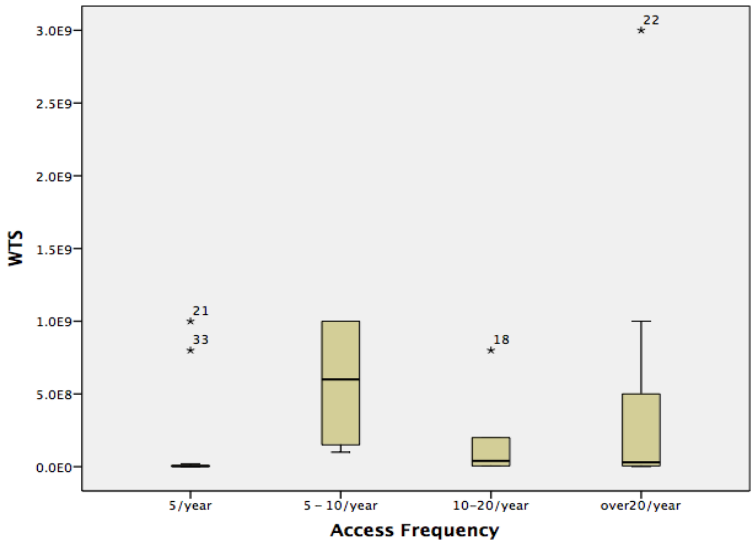



**Figure 49. Bay Park WTS & Access Frequency**

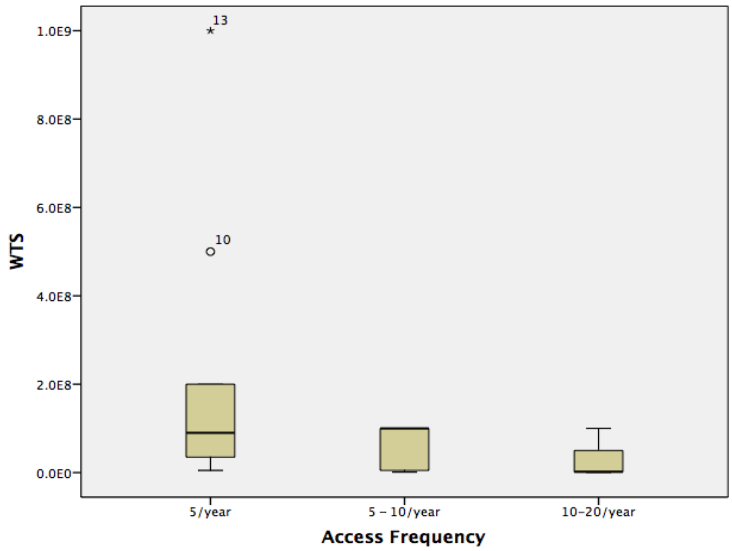



**Figure 50. Circular Road WTA & Access Frequency**

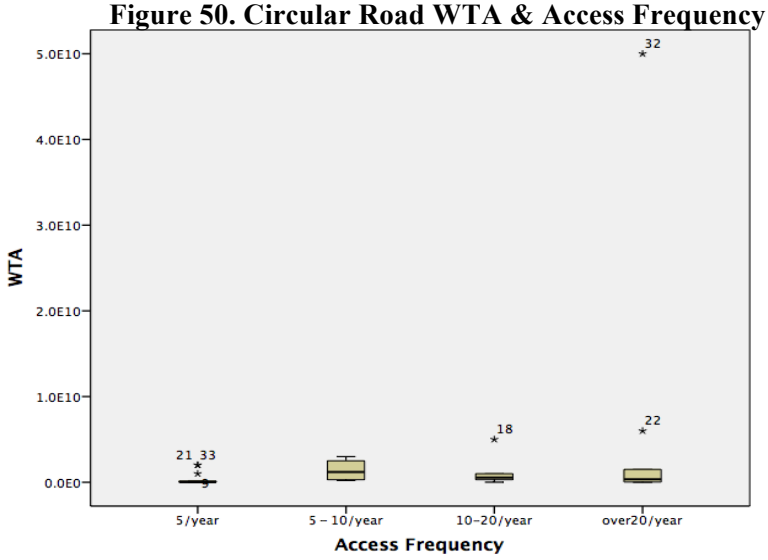
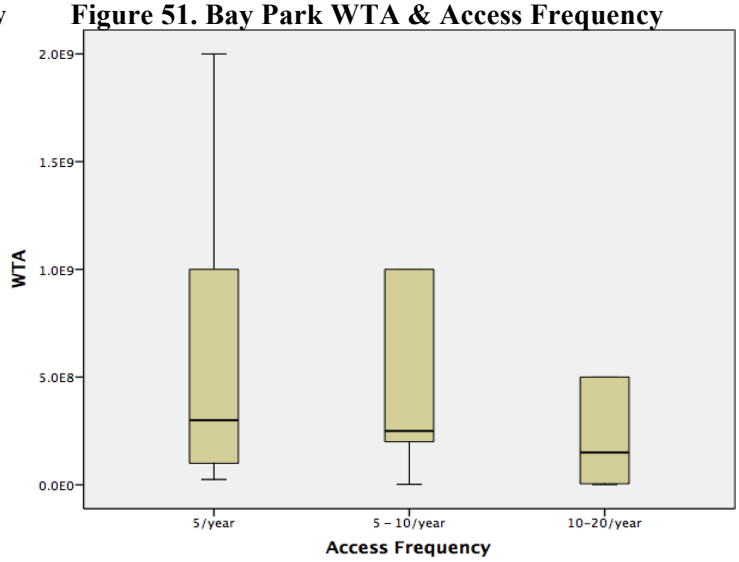



**Figure 51. Bay Park WTA & Access Frequency**



The seventh correlation analysis is access frequency, in Circular Road case, people who come to Circular Road more often are likely to pay more; and in Bay Park case, no clear relationship between WTP and access frequency.

See figure Circular Road WTS & Access frequency, the highest valuation value is almost the same and it means WTS is independent of access frequency, as long as the respondents have had a good understanding of the target place, they can valuate the place more objectively. While in Bay Park case it showed a negative correlation with frequency; less frequency people valuating Bay Park more maybe because the local people are not so satisfied with Bay Park now.

In WTA figure of Circular Road, it is likely high access frequency people would like to require more money for compensation while Bay Park is opposite, but not so obvious.

### 6.2.8 Access Purpose

**Figure 52. Circular Road WTP & Access Purpose**

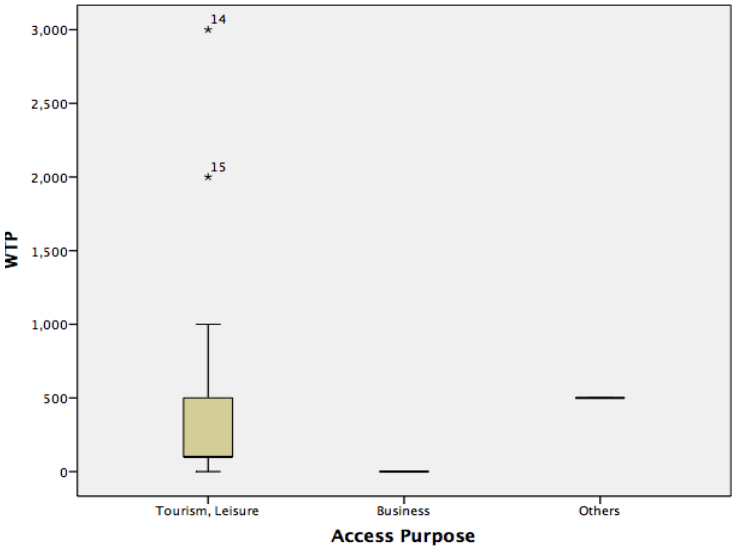



**Figure 53. Bay Park WTP & Access Purpose**

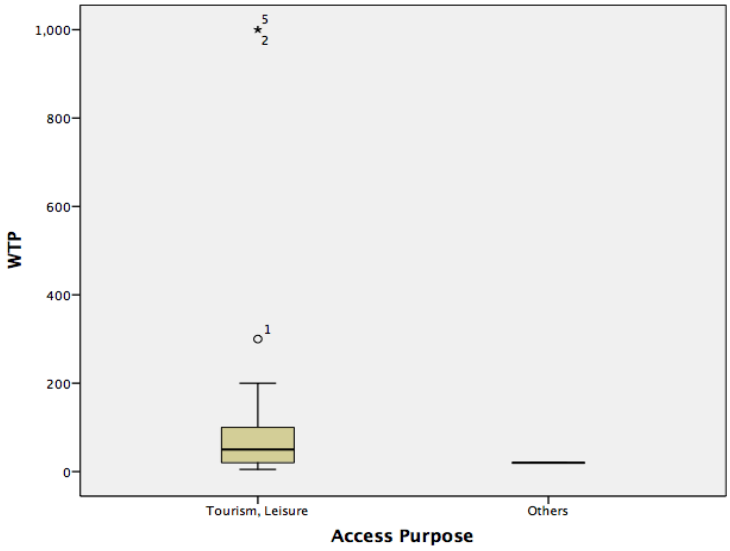



**Figure 54. Circular Road WTS & Access Purpose**

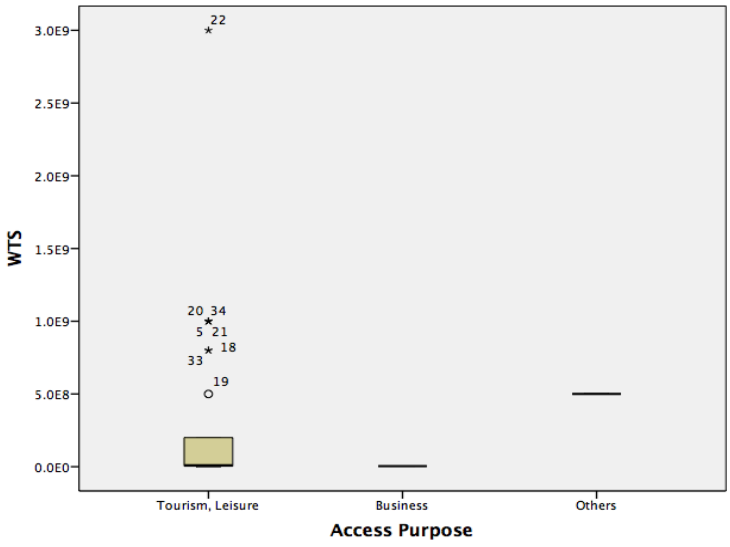



**Figure 55. Bay Park WTS & Access Purpose**

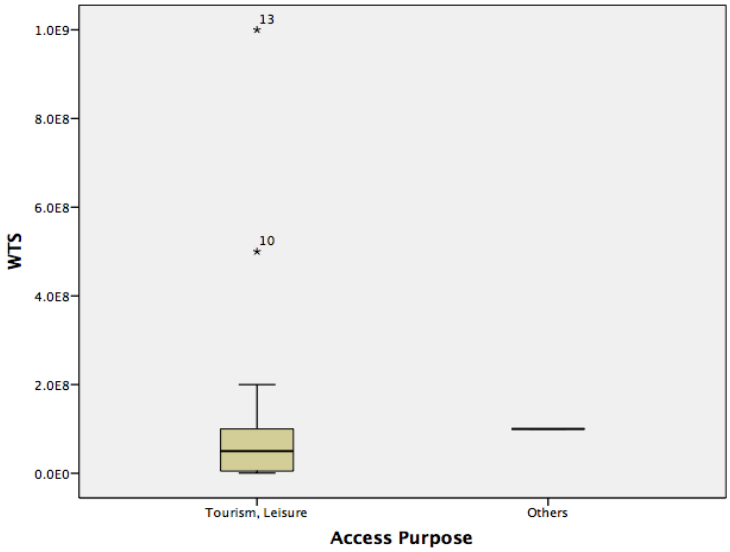



**Figure 56. Circular Road WTA & Access Purpose**

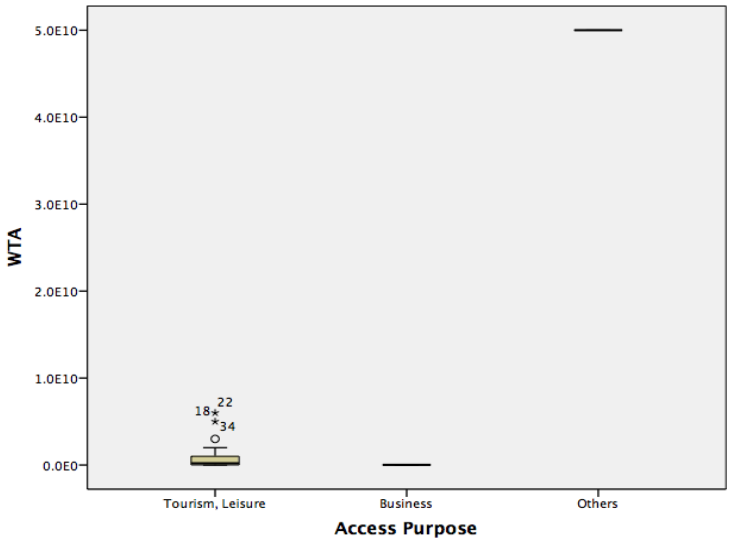
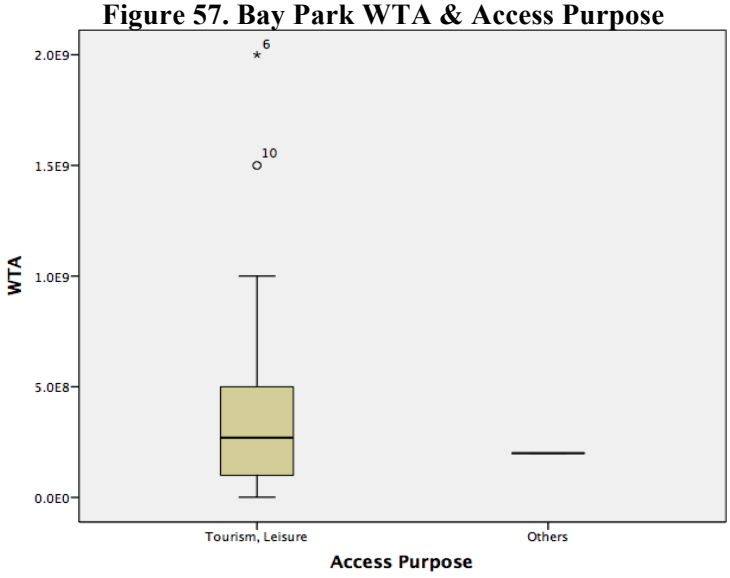



**Figure 57. Bay Park WTA & Access Purpose**



The eighth correlation analysis is access purpose, in both Circular Road and Bay Park case, most people are coming to the target place to travel or for leisure purpose, so, all the figures here showed the travel/ leisure purpose people would like to pay more money, valuate environment higher price and require more money for compensation.

### 6.2.9 Access Company

**Figure 58. Circular Road WTP & Company**

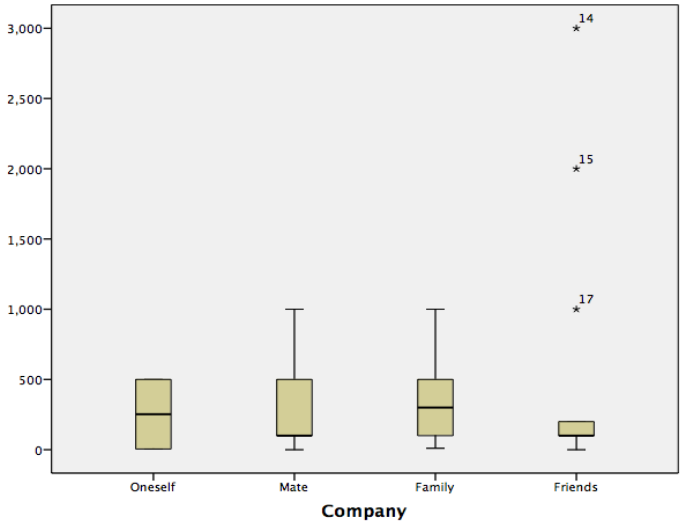



**Figure 59. Bay Park WTP & Company**

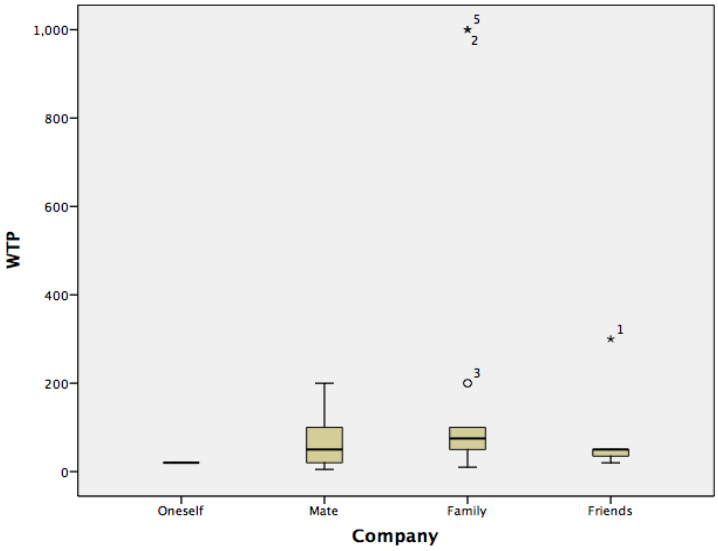



**Figure 60. Circular Road WTS & Company**

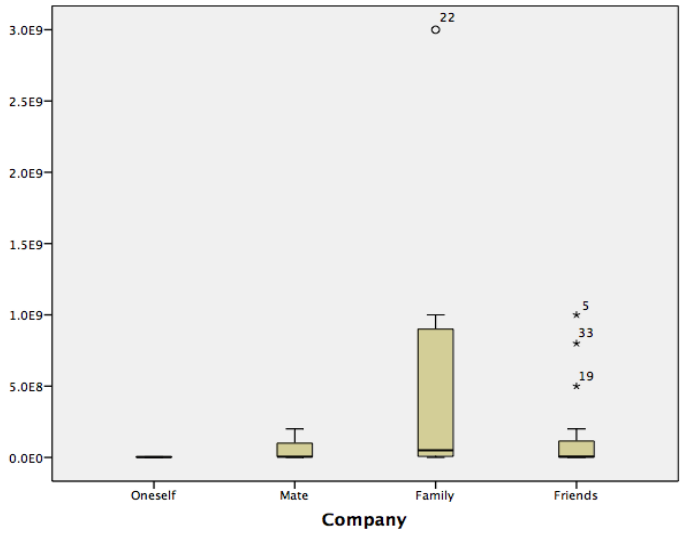



**Figure 61. Bay Park WTS & Company**

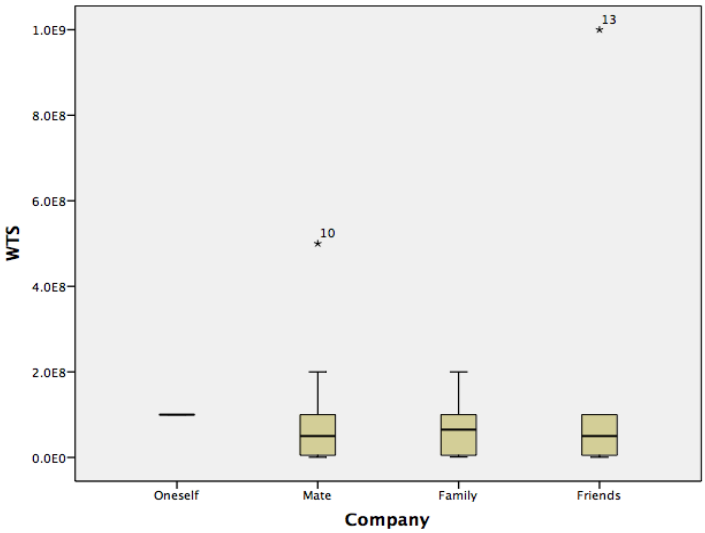



**Figure 62. Circular Road WTA & Company**

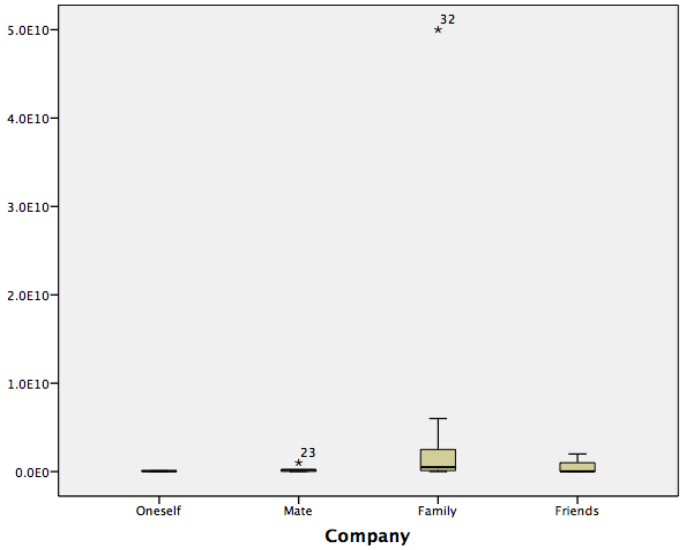
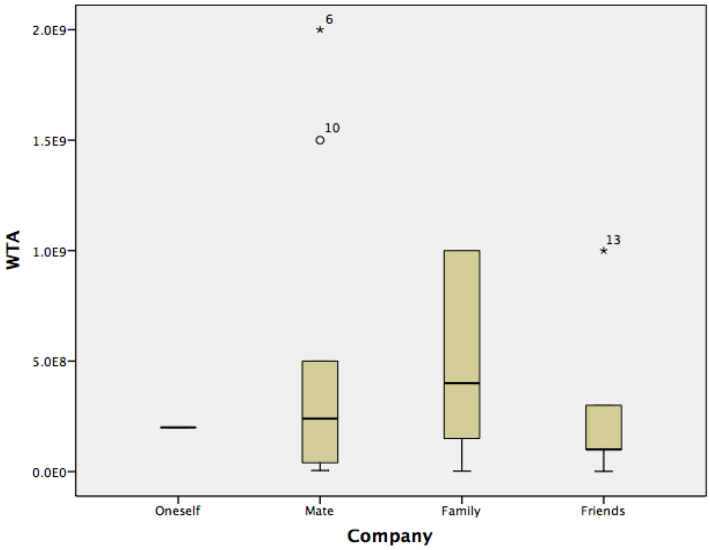



**Figure 63. Bay Park WTA & Company**



The ninth correlation analysis is about access company, in both Circular Road and Bay Park case, people who come with mate, family and friends are more likely to pay more money for environment or public services than those who come only their selves.

See figure Circular Road WTS & Company, people who come with their family are valuating the environment the highest price; while in Bay Park WTS & Company figure, the value is almost the same no matter whom they come with.

In both Circular Road and Bay Park WTA & Company figure, people who come with their family are likely to require more money for compensation. It also showed the importance of family members in Chinese people's thinking mode.

### 6.2.10 Importance of the place

**Figure 64. Circular Road WTP & Importance**

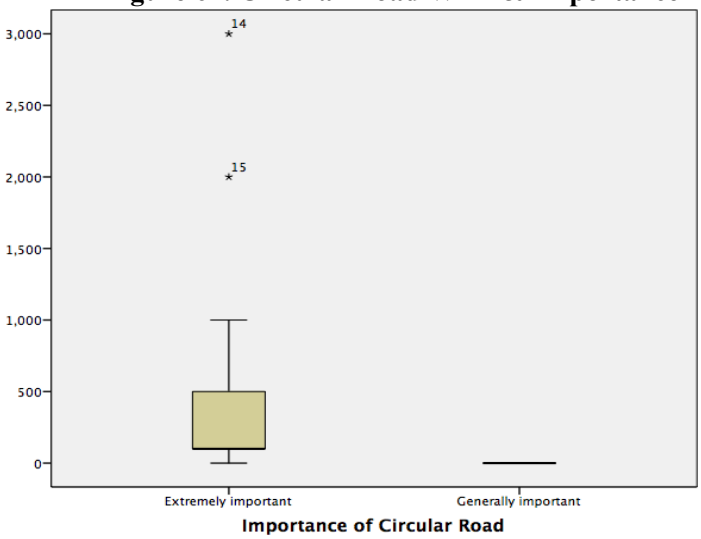



**Figure 65. Bay Park WTP & Importance**

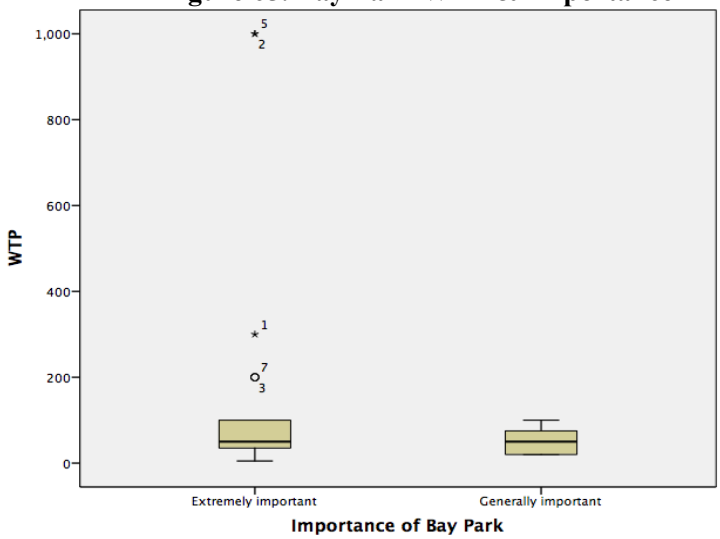



**Figure 66. Circular Road WTS & Importance**

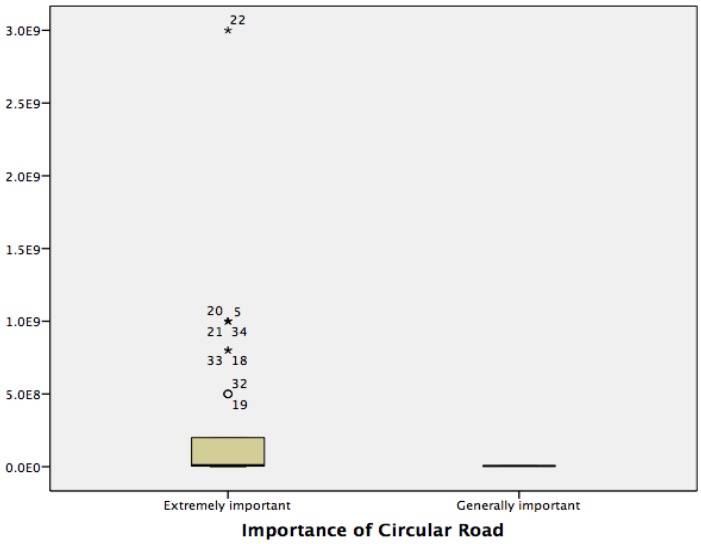



**Figure 67. Bay Park WTS & Importance**

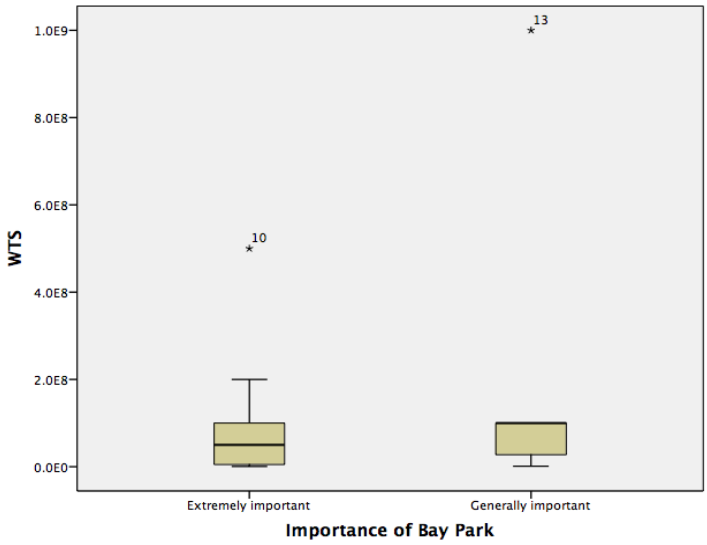



**Figure 68. Circular Road WTA & Importance**

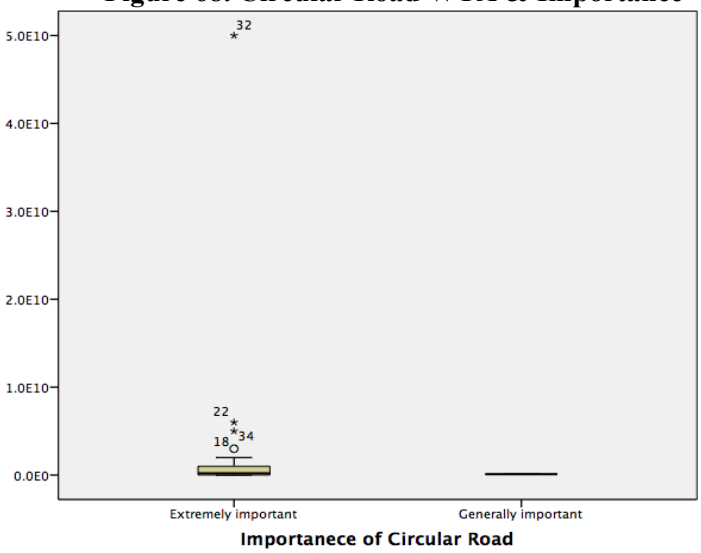
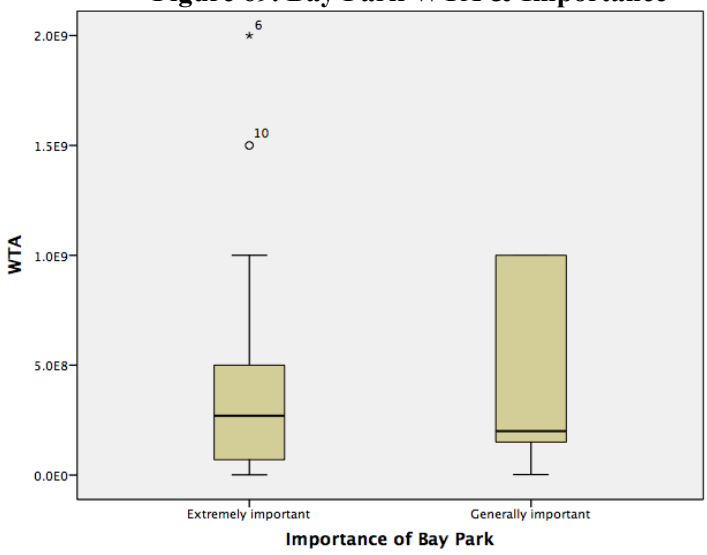



**Figure 69. Bay Park WTA & Importance**



The tenth correlation analysis is about the importance of the target place, in both Circular Road and Bay Park cases, people who think the target place is extremely important are likely to pay more money for the environment than those who just think the target place is generally important.

Both Circular Road and Bay Park case figure WTS & Importance showed extremely important thinking people are valuating the target place higher price, and Circular Road data is more obvious than Bay Park data.

And finally both Circular Road and Bay Park case WTA & Importance figure showed people who considering the target place extremely important would like to require more money than those generally important thinking people. While Bay Park data is also not so obvious like Circular Road data.

### 6.2.11 Satisfaction of the place

**Figure 70. Circular Road WTP & Satisfaction**

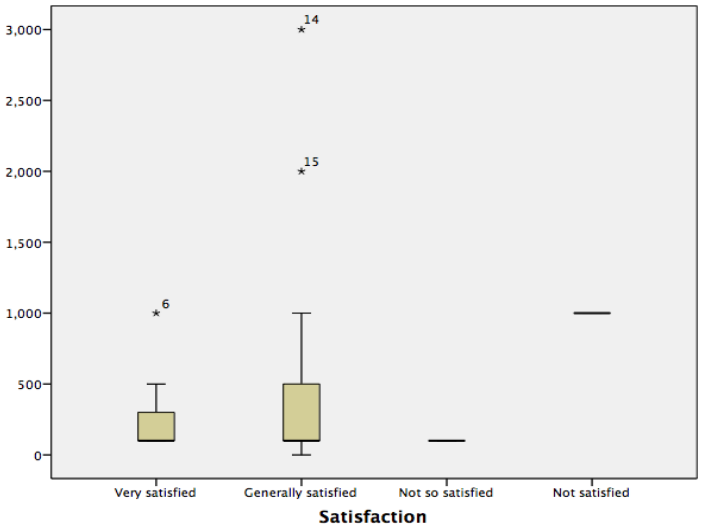



**Figure 71. Bay Park WTP & Satisfaction**

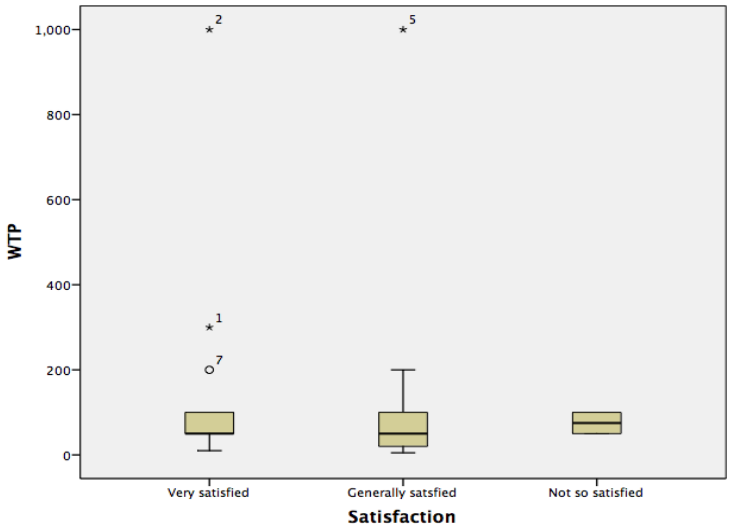



**Figure 72. Circular Road WTS & Satisfaction**

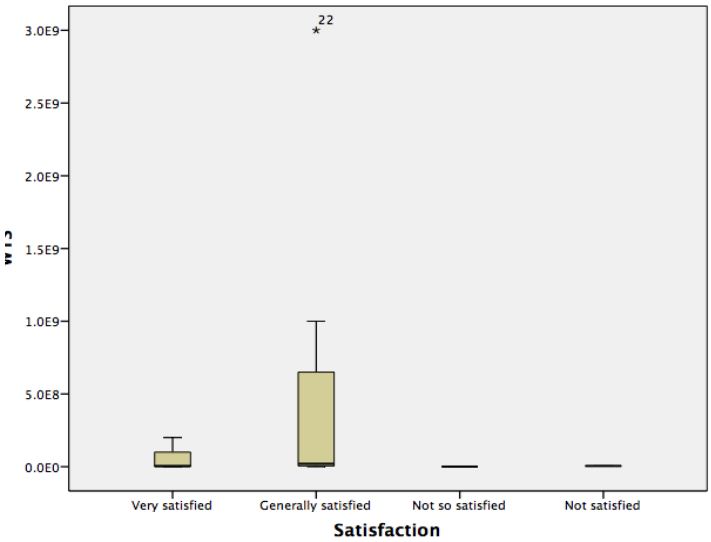



**Figure 73. Bay Park WTS & Satisfaction**

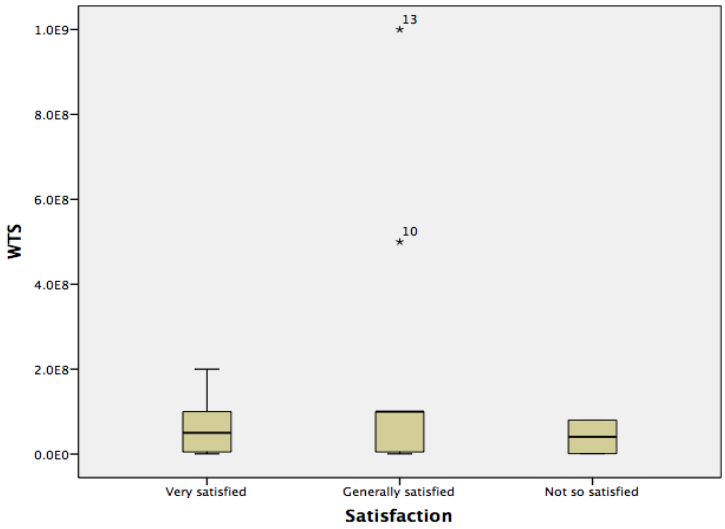



**Figure 74. Circular Road WTA & Satisfaction**

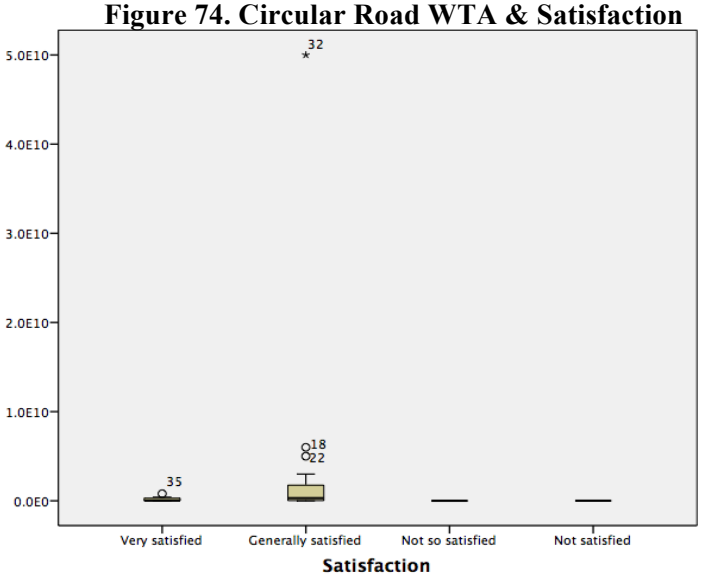
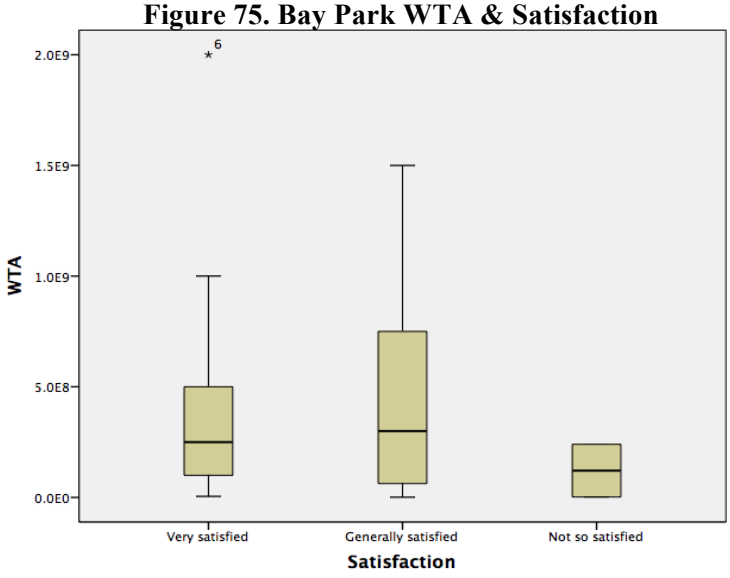



**Figure 75. Bay Park WTA & Satisfaction**



The eleventh correlation analysis is about the satisfaction of the target place, in both Circular Road and Bay Park cases, people with higher satisfaction of the target place would like to pay more money for the environment and public services.

While in figure Circular Road WTS & Satisfaction, people with just generally satisfaction are valuating the environment the highest price, and in Bay Park case almost equal value, but the highest WTS values also come from generally satisfaction.

Both Circular Road and Bay Park WTA & Satisfaction figure showed generally satisfied thinking people would like to require more money for compensation.

## 6.3 Discussion of the superiority and limit of WTS

Considering the target goods to be valuated, WTS is more suitable for general public goods and general government projects compared with WTP and WTA. In the process of field survey, the respondents will not under the mood of resistance like WTP questions; they are happy to answer the WTS questions compared with WTP questions. Besides, the final value of WTS is very closed to the real market unlike the huge bias of WTA and the too-low valuation of WTP; it can provide an advisable support on the investment of purchase public goods or the investment of the whole public project. Although all the social surveys depend on the personal characteristics of respondents more or less, WTS is free from the influence of many external factors compared with WTP.

While, WTS techniques also have many limits, such as WTS is better to valuate those small-scale projects, or small public goods because public respondents sometimes have no idea about very huge and expensive projects; It is really difficult to ask public to give a WTS price of a huge projects which they really don't know how much it can be sold. To overcome this problem, the investigator need to be full of experiences and can tell every detail of the huge project to the respondent. If the respondent asks how big is 20ha? The investigator should change it into small images quickly like: it equals how many basketball sports gym or it is similar with somewhere they already known well. While, generally, WTS of a small fountain is absolutely simpler to answer than WTS of a whole Olympic Parks; Besides, the WTS questions need more introductions than WTP or WTA questions because respondents should be told every details of the whole project as far as possible, so that they can valuate it more objectively; in order to control their thinking mode, interview survey may be the best choice, so the cost of WTS surveys maybe higher than WTP and WTA surveys; And WTS is requiring higher education level respondents sometime, better educated people can understand the projects and understand the questions better during the field survey.

# 7 Conclusion

Although respondents are not so many in this field survey, all the respondents were under good understanding when they were answering the questions. In this research, not only the economic values are concluded out, a deep exploration of their thinking mode is conducted, it is also the advantage of interview survey compared with general questionnaires. When they were considering WTP questions, about 89.86% considered their personal income level at the first time; when considering WTA questions, 100% answered the questions just on the basis of their own subjective feelings and imagination; and when they considering the WTS questions, about 98.55% were trying to consider the real market as a reference. This kind of thinking mode is even more important than a detail value, thus, a methodology can ask the respondents to valuate the public goods on the basis of considering the real market as a reference; and this kind of thinking mode is much closer to the essence of doing ecosystem service valuation.

Through the thinking mode research, it is found that WTP/WTA are still suitable to valuate clear positive/negative activity projects; and it is easy for respondents to understand to use WTP to valuate environment-protecting behaviors and WTA to value environmental damages. While, WTS is more suitable to valuate those general human projects that cannot tell positive or negative temporarily AND for all the general public goods; and WTS especially shows more superiority than WTP when valuate general public goods; because WTS is with more objectivity compared with WTA, WTP, and doesn't depend on respondents' personal factors (like income level), population size so much like WTP.

Although the social surveys are all under influences of the different characteristics of the respondents more or less, there is generally a same influence aspect in CV Method research: Education Level; the techniques in CV Method (WTS, WTP and WTA) ARE all under the influence of Education Level more or less, because compared with other social surveys, CV Method is difficult to understand to general public; And people with higher education level seem like to keep a better understanding on the CV survey questions. Especially for the correlation analysis of Circular Road and Bay Park, in many figures, Circular Road figures showed more reasonability than Bay Park because the Circular Road respondents are higher educated compared with Bay Park respondents.

When valuating human projects, WTS Value is much closer to Economic investment value. So when a project investment planning needs public opinion, WTS can be conducted as a reference of

suitable investment. In Amoy's case, investment of the Bay Park is 170,000,000¥ and WTS is 103,580,645.16¥, WTS of Circular Road Green Way Project is 277,197,368.42¥, so a reasonable investment from citizen's viewpoint can be computed based on the existing opening planning. Investment around 454,951,400¥ maybe suitable for the project of the Circular Road green way.

Strategy Environment Assessment is becoming more and more important in these years; Actually, there are many well-planning government projects developing into negative projects finally in every country, just like the Fukujima nuclear energy projects in Japan; and like many famous well-planning tourism places finally suffering from the population and huge traveler pressure. Strategy Environment Assessment should be a three-dimensional evaluating system considering every aspect of environment, economy, social, culture, human and so on. When doing City Planning and Strategy Environment Assessment, government should pay more attention to public opinion because good government should represent citizens. New CV Method is no more just a game-methodology full of imagination and uncertain factors; it can offer an advisable financial value support for local government. Besides, the economic value of ecosystem service in new CV Method should not be an absolute value; it should be a multi perspective comparative relative value, just like it is difficult to conclude an economic value of water or air, but it is possible to compare the water and the air.

This research built the WTS (and WTD) theory and finished serious verifying experiments, while the details of the WTS survey design techniques have not been concluded deeply in system; And more researches of the techniques and applications of WTD should be focused more in the future research work.

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