An Attempt of Valuation about the Linear Open Space Incorporated with River or Street by a Questionnaire Survey for Residents

—— Case Study for Shukugawa Park in Nishinomiya City ——

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Synopsis

In order to seek for the effect of the linear open space incorporated with river or street (linear green belt), a questionnaire survey was carried out for inhabitants in the neighborhood of the Shukugawa Park, which were located in Nishinomiya City, Hyogo Prefecture. In the survey, consciousness for the four items of effect of the linear open space and willingness to pay amount for the value, were asked. The result from the survey are explained as follows; 1) among the four items of effect, the environment preservation effect is most valuable for neighboring residents, 2) as for use value, the median WTP amount for using fee is 200 yen, 3) as for comprehensive existence value, the mean WTP amount is 8,416 yen, the median WTP amount is in the range of 5,000 – 10,000 yen.

KEYWORDS: linear open space, AHP, Conjoint Analysis, CVM, conscious evaluation, disasters prevention planning

1. Introduction

After the Hanshin-Awaji Great Earthquake, we learned that the linear open space systems along river or street, should be provided as not only the firebreak and refuge route but also the spatial living space. Generally speaking, the value of parks and open space is considered to have four items of effect, that is, "townscape", "environment preservation", "disasters-prevention" and "recreational space". However, it is difficult for the linear open space, which have various effects, to be analyzed and to be come true. Because the linear open space compound of these functions and their effect is not be recognized clearly.

In this study, we investigated the Shukugawa Park situated in Nishinomiya City, Hyogo Prefecture. Then we carried out a questionnaire survey for residents in the neighborhood. The consequents were analyzed on their consciousness, by means of "Analytic Hierarchy Process (AHP)", "Conjoint Analysis" and "Contingent Valuation Method (CVM)". The result of this study will be a kind of knowledge to seek for the comprehensive effect of the linear open space.

2. Method of Research

1) The overview at the Shukugawa Park

The Shukugawa Park, situated in the southern part of Nishinomiya City, has been completed in order as riverside park along the Shukugawa River, connects with the Koroen Beach and the Kitayama Park. On the bank of river, cherry trees form a line and a lot of people visit to see the blossom in the season. Furthermore, it is useful for the good view and habitation in the town, specified by the scenic beauty area. The citizens are proud of the

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Shukugawa Park as the green symbol. The Shukugawa Park is 4.1 km in length, 60-70m in width. As for the cross-section shape, it arranges a stream at the center, green space and footpath on both sides (Figure-1).

2) Outline of Investigation

The research area is a habitation place which neighbors the Shukugawa Park within about 500m, that is, the sphere on foot. In December 1999, a questionnaire survey was carried out in the area shown in Figure-2, obtaining cooperation from the resident society of the neighborhood block in distribution and collection of the questionnaires.
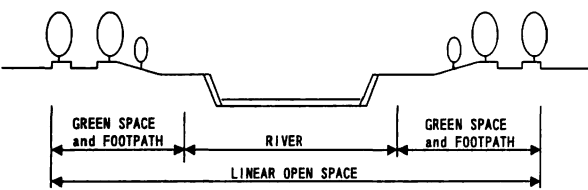

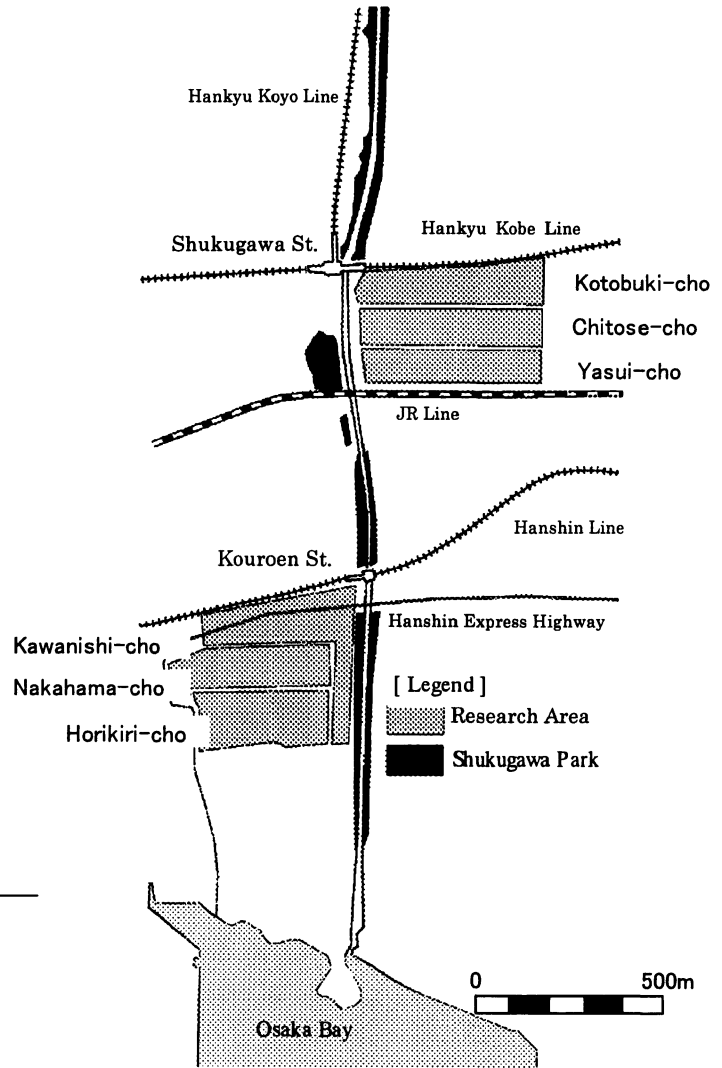Figure-1 View of the Shukugawa Park and Typical Cross Section

Figure-2 The Study Area

3) Survey Design

We asked criterion four items of effects of the Shukugawa Park, "townscape", "environment preservation", "disasters prevention" and "recreation" by showing with the illustration. Next, we tried the comprehensive evaluation of "use value" and "existence value" of the Shukugawa Park by using CVM.

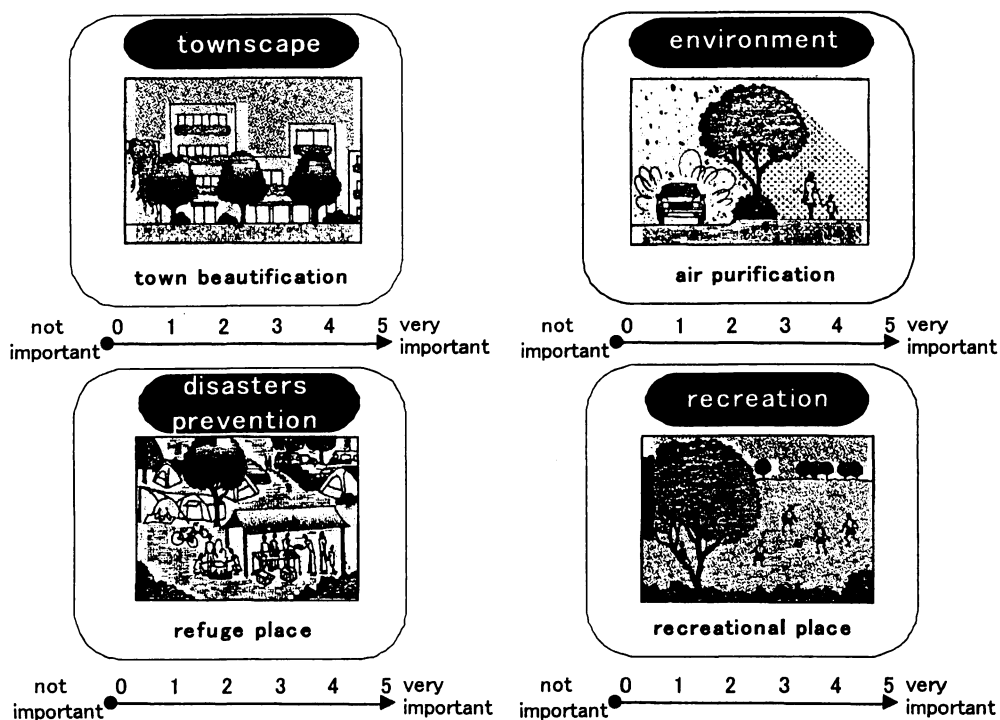a) Relative Importance to Four Items of Effect of Shukugawa Park

Three quantitative evaluation methods of the relative importance of four items of effect were examined in case of Shukugawa Park, as follows.

①Independent Evaluation Method

A question, how much important the scale of value of each effect, is asked independently by evaluation five steps. This quantitative evaluation is named as "Independent Evaluation Method" here.

(Question Sentence)

The effectiveness of parks and open space in the city is considered to have two major effects, that is, "existence effect" such as townscape, environment preservation and protection against disasters which is brought about by existence and "use effect" which is brought about by recreational using. What do you think how valuable is the Shukugawa Park for each item of effect that is shown below? If you will evaluate the better, put O to the bigger figure in the scale.

townscape

town beautification

not important 0 1 2 3 4 5 very important

environment

air purification

not important 0 1 2 3 4 5 very important

disasters prevention

refuge place

not important 0 1 2 3 4 5 very important

recreation

recreational place

not important 0 1 2 3 4 5 very important

②AHP(Analytic Hierarchy Process)

A question is asked which is more important about each pair of two items of effect in comparison. There are 6 combinations with four items of effect.

(Question Sentence)

Which do you think more important when you compare each two in four items of effect of the Shukugawa Park; townscape, environment, disasters-prevention, recreation, shown in the previous page? Put O to the applied figure on the scale.

townscape	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	environment
disasters -prevention	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	recreation
townscape	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	disasters -prevention
environment	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	recreation
disasters -prevention	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	environment
recreation	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	townscape

scale of value	definition
1	equal importance
3	weak importance
5	strong importance
7	very strong importance
9	absolute importance

③ Conjoint Analysis

It assumes the imaginary condition that some from four items of effect are lost from the present condition of the Shukugawa Park. Eight effective patterns to the comparative analysis are selected from 16 possible cases with the effects made to be lost. The comparative tables, which combined 2 patterns, are prepared, and then asked to choose either condition is preferred for respondent.

(Question Sentence)

The Shukugawa Park has four effects, townscape, environment, disasters-prevention and recreation, shown in the previous page. First, let's assume that some effects would be eliminated from the Shukugawa Park as like with following 1 - 14 cases. When you must choose either A or B, which is more desirable for you? Put O to the more desirable case, A or B.

In the following table, O means that the effect is useful ordinarily, X means that the effect is eliminated.

1	townscape	environment	disasters-prevention	recreation
A	O	X	O	O
B	X	O	O	X

8	townscape	environment	disasters-prevention	recreation
A	X	O	O	X
B	X	X	X	O

2	townscape	environment	disasters-prevention	recreation
A	O	X	O	O
B	O	O	X	X

9	townscape	environment	disasters-prevention	recreation
A	O	X	O	X
B	X	O	O	O

3	townscape	environment	disasters-prevention	recreation
A	O	X	O	O
B	X	O	O	O

10	townscape	environment	disasters-prevention	recreation
A	O	X	O	X
B	O	O	X	O

4	townscape	environment	disasters-prevention	recreation
A	O	X	O	O
B	O	O	X	O

11	townscape	environment	disasters-prevention	recreation
A	O	X	O	X
B	X	X	X	O

5	townscape	environment	disasters-prevention	recreation
A	X	O	O	X
B	O	X	O	X

12	townscape	environment	disasters-prevention	recreation
A	O	O	X	X
B	X	O	O	O

6	townscape	environment	disasters-prevention	recreation
A	X	O	O	X
B	O	O	X	X

13	townscape	environment	disasters-prevention	recreation
A	O	O	X	X
B	X	X	X	O

7	townscape	environment	disasters-prevention	recreation
A	X	O	O	X
B	O	O	X	O

14	townscape	environment	disasters-prevention	recreation
A	X	O	O	O
B	O	O	X	O

b) Contingent Valuation Method (CVM)

This method uses survey questions to elicit people's willingness to pay (WTP) amount in yen for the use value and existence value of the Shukugawa Park which each resident feels for. First, elicitation method used open-end, that is, how much entrance fee to be admitted into the recreational area people will pay.

Next, for comprehensive existence value is asked that how much money make a contribution to preservation of the Shukugawa Park. In order to maintain the present situation of the Shukugawa Park, usual management cost is necessary in the future.

This investigation had a purpose of evaluation for the present existence value at the Shukugawa Park from the residents' consciousness. Therefore, assuming that the Shukugawa Park is destroyed completely, the survey question was made to elicit people's WTP for the preservation by contribution.

CV elicitation method used double-bound dichotomous choice that is most reliable and less bias. In case of the subscription form, to think that the bias to refuse a payment occurred, open-end way was not taken. Table-1 shows a potential WTP amount in the four investigation votes.

Table-1 Setting the WTP amount

T1: Firstly presented price (yen).	TU: Secondly presented price (yen), in case of agreement for T1.	TL: Secondly presented price (yen), in case of disagreement for T1.
3,000	5,000	1,000
5,000	10,000	3,000
10,000	20,000	5,000
20,000	40,000	10,000

(Question Sentence)

We would like to ask you a few questions to see how you feel about value. Also, the question is fiction for the estimation of the value and is not concerned with actual policy.

(1) How much would you be willing to pay entrance fee to use the Shukugawa Park?

_____ yen

(2) Let's assume that green environment along Shukugawa River is absent from the present Shukugawa Park. Let's also assume that residents are to preserve environment by making a contribution. How much would you be willing to pay as family contribution in order to maintain the present environmental condition?

● In the case that amount money is T1 yen

1　I would like to pay.　　　　　　　　　　　2　I do not want to pay.

●In the case that amount money is TU yen

1 . I would like to pay.

2 . I do not want to pay.

note: TU > T1

●In the case that amount money is TL yen

1 . I would like to pay.

2 . I do not want to pay.

note: TL < T1

3.　Consequence of Analysis

1) Which Effect is Important?

Table-2 shows the number of respondents. Figure-3 shows the percentage of relative importance according to the each quantitative evaluation method. From figure-3, the both consequence analyzed by "Independent Evaluation Method" and "AHP" accounted for the approximately same percentage with "townscape" and "environment". Then "recreation" and "disasters-prevention" followed.

Table-2 Number of Respondents

Evaluation method	Number of respondents	Effective respondents	Percentage
Independent Evaluation method	294	281	95%
AHP	294	220	75%
Conjoint Analysis	294	216	73%

On the other hand, the consequence analyzed by "Conjoint Analysis", "environment" accounted for the largest share, "recreation" in the 2nd place, "disasters-prevention" in the 3rd place, "townscape" followed. This shows

Independent Evaluation Method: 26.5%　26.1%　22.2%　25.1%

AHP: 26.8%　26.1%　22.0%　25.2%

Conjoint Analysis: 21.1%　33.3%　22.1%　23.5%
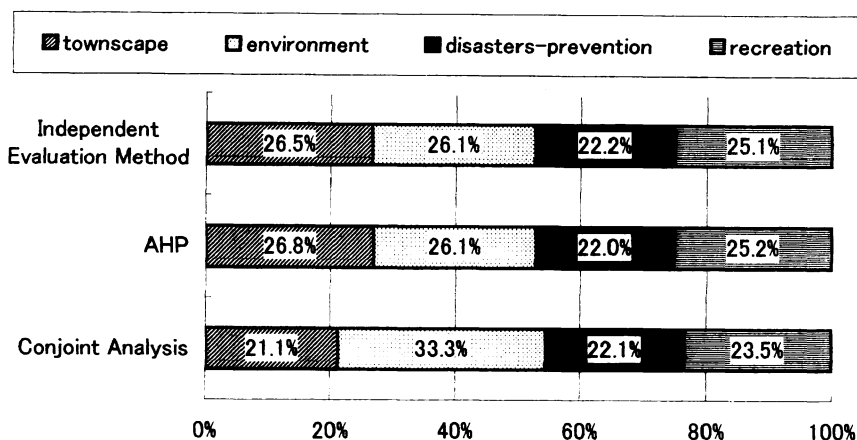
0%　20%　40%　60%　80%　100%

Figure-3 Relative Importance in Percentage

that the resident's preference about four items of effect did not appeared by means of evaluation method, "Independent Evaluation Method" and "AHP". But by "Conjoint Analysis" it appeared conspicuously.

In the case as four items of effect are compound like the Shukugawa Park, it is possible to say that the conjoint analysis is useful, as this method can be always examined in the comparison in the whole situation. As a result, it seems that neighboring residents thought "environment preservation effect" most valuable, and gave priority as following order, "recreational effect", "disasters-prevention effect" and "townscape effect".

2) Value of the Shukugawa Park by CVM

①Use Value for Every Visit

Among the 294 respondents, 145 were effective answer, 145 were not being entered the fee. Answer ratio is approximately 49%.

It is considered that the respondents who seldom visit the Shukugawa Park would not like to pay using fee. But the relationship, between frequency of visiting and non-responses, was not appeared. Therefore, among the respondents who often visit the Shukugawa Park, there are some people who refuse to pay for use effect.

The WTP amount for using fee is shown in Table-3 and Figure-4, except non-responses. There were respondents from 100 yen to less than 200 yen, and respondents from 500 yen to less than 2,000 yen followed. The median WTP amount was 200 yen.

Table-3 Number of Respondents to WTP for Using Fee by Frequency of Visiting

WTP for using fee (more than ¥)	almost every day	a few times a week	scarcely visit	no answer	Total
no answer	79	31	38	1	149
¥0	3	3	5	0	11
¥10~	1	1	2	0	4
¥20~	1	0	0	0	1
¥30~	2	0	0	0	2
¥50~	5	2	3	0	10
¥100~	20	7	12	0	39
¥200~	4	2	2	0	8
¥300~	4	3	7	0	14
¥400~	0	3	0	0	3
¥500~	6	8	8	0	22
¥1000~	9	4	7	0	20
¥2000~	1	0	2	0	3
¥3000~	2	0	0	0	2
¥4000~	0	1	0	0	1
¥5000~	2	1	2	0	5
Total	139	66	88	1	294

It is supposed that the two response groups, from 100 yen to less than 200 yen and from 500 yen to less than 2,000 yen, depend on respondent's attribute; the way of use, scenic condition, frequency of visiting etc. So, by making the comparison between respondent's attribute and WTP amount, responded fee was not brought by the way of use and scenic condition, but relationship between frequency of visiting and WTP amount was appeared.

It can be said that residents visit more frequently, the less WTP amount for using fee, at least that plenty of residents intend to pay 200 yen for using fee.
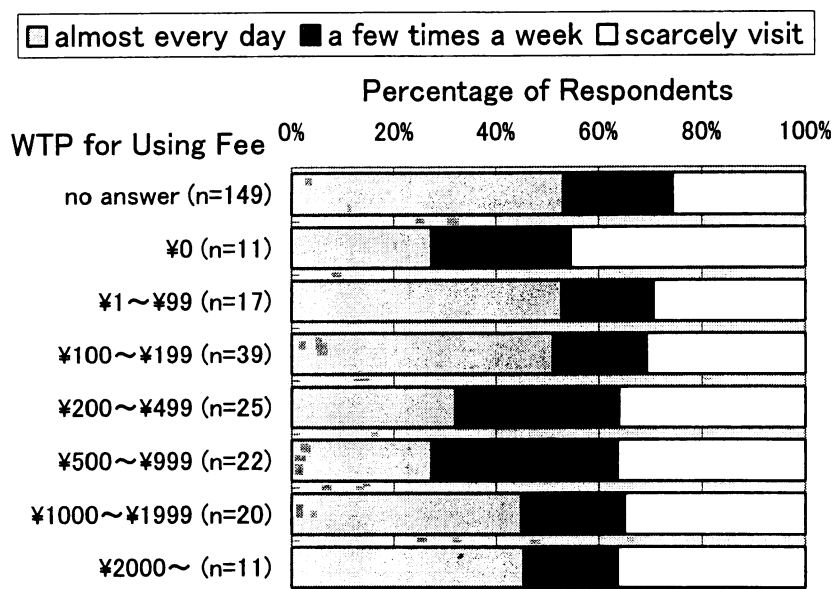

Figure-4 Relationship between Frequency of Visiting and WTP for Using Fee

② Comprehensive Existence Value

Among the 294 respondents, samples for analysis, which was obtained by the double bound dichotomous choice, were 224 and the effective answers were 179.

Table-4 shows a potential WTP amount and yeas and nays. In the table, Y shows approval and N shows disapproval. YN means to approve the 1st shown potential WTP, but to disapprove the 2nd shown.

Table-4 Presented price and approval or disapproval

Firstly presented price (yen)	YY	YN	NY	NN	Total
3,000	19	7	15	5	46
5,000	16	10	13	14	53
10,000	5	7	15	12	39
20,000	4	5	16	16	41
total	44	29	59	47	179

The method of estimating the WTP amount by a respondent used nonparametric survival analysis[*] decided from the data of the double bound dichotomous choice.

Consequence of survival analysis is shown in Figure-5. From this graph, we obtained mean WTP; 8,416 yen, and mean WTP; in the range of 5,000-10,000 yen.

Figure-5 Survival Curve
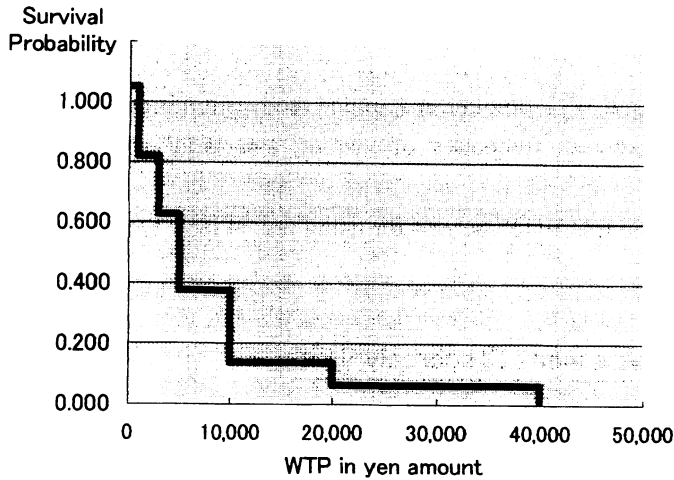
Lower	Upper	Survival Probabilit	t-value	P-value
0	1000	1.049	50.28	3.6176E-105 ***
1000	3000	0.819	24.30	1.14787E-57 ***
3000	5000	0.625	15.75	2.9849E-35 ***
5000	10000	0.375	9.37	3.88335E-17 ***
10000	20000	0.136	4.18	4.55161E-05 ***
20000	40000	0.063	2.28	0.0237 **
40000	+∞	0.000		

n	179	***1%level of significance
Logarithmic Likelihood	<-224.4	**5%level of significance

4 Summary and Remaining Issues

The results from the research of valuation about the Shukugawa Park will be summarized as follows.

1. In the case as four items of effect are compound like the Shukugawa Park, it is possible to say that the conjoint analysis is useful. Because this method can be always examined in the comparison in the whole situation.

2. It seems that neighboring residents thought "environment preservation effect" most valuable, followed by "recreational effect", "disasters-prevention effect" and "townscape effect".

3. As for use value, the WTP amount showed two peaks as more than ¥100 below ¥200, and more than ¥500 below ¥2,000. The median WTP amount for using fee is ¥200.

4. As for comprehensive existence value, the mean WTP amount is ¥8,416; the median WTP amount is in the range of ¥5,000 – ¥10,000.

It is possible to say that these results will become the effective key to construct the linear open space effectively according to the resident's preference. In the future, it will be necessary to investigation with the more detailed evaluation item.

Also, it is considered that the estimated WTP amount, which was obtained by CVM, shows the tendency of the value evaluation on the consciousness of the circumference habitant in some degree. This result will be the basic information of the total benefit for the linear open space. It will be necessary to study respondent's attribute, elicitation method, and biases in more detail in order to estimate the total benefit.

Acknowledgement

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Reference

*) Kuriyama K.: CVM using Excel, Report on Environmental Evaluation Forum, November 1998 (in Japanese)