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Study on Diversified Developments Improving Environmental Values -In Case of University Campus -

Kuriko Iwai, and Michihiro Kita

***Abstract*—**This study aims to clarify constructions which enable to improve socio-cultural values of environments and also to obtain new knowledge on selecting development plans. CVM is adopted as a method of evaluation. As a case of the research, university campus (CP; the following) is selected on account of its various environments, institutions and many users. Investigations were conducted from 4 points of view, total value and utility value of whole CP environments, values of each environment existing in CP or development plan assumed in CP. Furthermore, respondents' attributes were also investigated. In consequence, the following is obtained. 1) Almost all of total value of CP is composed of utility value of direct use. 2) Each of environment and development plans whose value is the highest is clarified. 3) Moreover, development plan to improve environmental value the most is specified.

***Keywords*—**CVM, Development Plans, University Campus, Improvement of Environments Value.

I. Introduction

TRADITIONALLY, development projects were made decisions only by attaching importance to earning rates, terms of construction works and political influences, which lead to slight developments' influence to socio-cultural values these areas originally have. In addiction, development projects were usually not practiced with recognizing areas broadly at long-term point of view.

In this paper, it is advocated to decide development projects which enable to improve socio-cultural values of environments and to keep them for a long time, which was proceeded at two points below.

1) Planning of plural developments at a long term viewpoint

Plural patterns of development projects were assumed in order to evaluate those influences to socio-cultural values around developing environments, which is considered based on calculations of those appraised values. Furthermore, environmental values lost by practicing these developments are clarified.

2) Relative evaluation of diversified developments and existing environments

The development project considered to improve environmental values the most is decided through evaluating values lost or appeared by practicing developments.

CVM[*1] is adopted as an appropriate way of valuation, which is verified throughout evaluations of various environments and diversified developments. And also the adaptability of CVM to the aims of this study is considered.

II. The Investigation Case

A university campus is decided to adopt as a case of this study, just because national environments and historic property existing there are important resources not only for universities themselves but also communities around CP, which causes to increase necessity of universities' sociality and openness in order to become places of exchanging between community and university. As usual, evaluations of socio-cultural values were not often grappled with, such as national environments, historic property and exchanging to community, especially at a viewpoint of people blessed with CP envelopments. And also studies on methods to decide developments improving these values effectively were not enough, in spite of increasing needs to develop CP environments strategically by university's own source of revenue.

University is interpreted as a sort of urban miniatures because of its plenty users, environmental accumulations and variety of activity. So it is natural to grow louder for requests for appropriate development plans, just as it was a city to construct environments comfortable.

There are many numbers of campuses, Toyonaka CP of the Osaka University is selected as an appropriate case of this study due to various factors such as its potential in socio-cultural values, and plenty number of inhabitants around CP, and pressure of developments caused by limitation of site area in CP and integration to another university[*3].

III. The Outline of Previous Study

A. Study on Campus Planning

Many researches dealing with CP planning were conducted in the past [1], though study on socio-cultural values existing in CP or developments influences to them, which is the main theme of this study, was not confirmed. At this point, this study is the first attempt of all.

B. Study on Evaluation to Socio-cultural Value by Means of CVM

Studies based on CVM are classified into 1; study on evaluation of environments and projects by using CVM and 2; study on techniques to apply CVM. This study comes under 1, the case history of studies on 1 gives examples such as evaluation of nature [2], environments and views of historical city area [3] [4], and as evaluations of projects, values of a barrier-free project held in stations and institutions [5], improving living environments [6], tree planting rooftops [7], a move of metropolitan functions [8], constructions of shores [9] and so on. Although many studies were conducted, this is the first attempt to take CP as a case in order to evaluate various environments and developments expected to conduct there.

Analyses of evaluations by using CVM give examples such as a relationship between attributes and WTP [2] [5] [9], classification of total values such as utility value [3] [4], verification of projects profits [8], application to reach mutual agreements about development projects [10], and so on. In this study, relationships between WTP and attributes of respondents and also evaluations of CP construction are investigated.

IV. Evaluations by Using CVM

A. Meaning of Adopting CVM

Beside CVM, for typical examples of the way to evaluate environments quantitatively, the Substitution Method or the Travel-cost Method is taken. Compared to them, CVM has much

wider application range, so that it can apply to anything, in theory, if only virtual markets can be constructed, which makes it possible to evaluate CP environments at various viewpoints. Furthermore, using questionnaires enable to take respondents' opinions into projects, and utilizing amount of money as unit of evaluation also enable to evaluate values relatively.

B. Technical Issues of CVM

Although using CVM enable to evaluate various kinds of values in theory, its reliability is always open to question, because of taking questionnaire as the way of investigation. Especially bias, which represent to make difference from true values caused by various factors such as content of explanations or ways to answer questions, is regarded as the most questionable matter. Therefore it is important to hold the bias to the minimum in order to raise reliability of investigation using CVM.

V. The Process of the Study

In this study, the process bellow was conducted in order.

1) Determining survey design to make evaluation forms
2) Conducting investigations using evaluation forms
3) Analyzing results of investigations statistically at various points of view
4) Based on results of analyses, estimating total appraised values and profits of long-term developments.

VI. The Survey Design

A. The Subjects of Investigations

Students, the faculty and inhabitants around CP were chosen as subjects of investigations just because they were considered to have opportunities to enjoy CP environments frequently (Table I1).

In terms of inhabitants, all of households living within a range of some 1 km[*4] distance from the edge of CP, which means ordinary people can visit on foot, were selected. On the other hand, students and the faculty commuting to Toyonaka CP at time of conducting investigations were chosen as subjects.

All of three, having chances to visit CP in their daily lives is the most important condition to select.

B. The Order of CVM Investigations

All of investigations were conducted based on the process bellow.

1) Establishment of the plural sorts of investigations

In order to evaluate and analyze CP at various angles, 4 kinds of surveys were established (Table II).

In the investigation number Ⅲ(Inv. #; the following), 12 types of areas which is regarded as a symbol of CP or expected to be constructed in the near future were adopted as subjects to investigate (Table III).

In the Inv. Ⅴ, 5 patterns of development projects were settled on by putting some assumed constructions together based on results of the survey which has been conducted to establish the Campus Master Plan[*5] (Table IV). In order to define what type of CP environments respondents hope, decision of development projects attached importance to specify merits and demerits caused by these practices. Concerning where to construct or how to make a development project, it was decided by considering results of hearing investigations to the charge posts such as the Campus Design Laboratory and the Institution Department, which enable to assume more practical development plans. Extensions or reconstructions of buildings where lectures or researches are held or repairing of roads excludes from the investigation subjects because the government grants a subsidy to these developments.

2) Information showed to respondents

On filling out the investigation forms, respondents look through pictures, image illustrations and itemized explanatory notes about each investigation subject. This information is based on content of references, HP and listening investigations to the charge posts. On the occasion of collecting information, its reliability was paid much attention, and also in order to keep values of bias minimum, conditions of taking pictures or making illustrations were matched in all investigations.

3) Question of WTP

a) Establishment of Scenarios

Scenarios used in the Inv. # 1-3 are shown on the Table V. In the Inv. # 3, different scenarios were assigned in every 12 patterns of investigations (Table V). While in the Inv # 5, it was adopted as scenarios to collect expenses from CP users because lack of university's own funds or government subsidy made it harder to maintain CP environments in the present condition. And if enough funds were collected, it would be able to practice maintenance to keep environments clean and comfortable as usual.

TABLE I
DETAILS OF INVESTIGATION SUBJECTS[*2]

Students		The Faculty		Inhabitants around CP	
Total number	11,456	Total number	1,217	Total number of Households	20,657
University Graduate School	8,158 3,298	Teaching Staff Working Staff	697 520	Ikeda City Mino City Toyonaka City	5,640 3,277 11,740

TABLE II
TYPES OF ASSUMED INVESTIGATIONS

Inv. #	Type	Contents of Survey
Ⅰ	Total appraised value of CP environments	Estimating an appraised value of whole CP environments at the present time
Ⅱ	Utility value of directly use of CP environments	Estimating a value of CP environments from an angle of utilizing
Ⅲ	Total appraised value of specific environments existing in CP	Evaluating values of specific environments existing in CP, such as ponds or gardens, to choose 12 areas as typical examples of CP
Ⅴ	Utility value of directly use of CP environments after developments	Evaluating each value of CP environments where 5 patterns of development projects are suppose to be conducted

b) Presentation of Money Amounts

After reading scenarios, respondents were given questions on payments of certain amounts which are composed of 3 patterns of the choices such as 1) agree, 2) disagree, which signify that respondents request less expensive payment than presented amount of money, and 3) disagree to form of questions itself including payment way.

As a way to inquire WTP to respondents, the Single-Bound Method was adopted due to its characteristic property of being hard to cause bias and to easy to reply for respondents. And as a way of payment, contribution to funds was adopted for the purpose of finding out WTP based on respondents' free will. Terms of paying contributions were decided 1 year and respondents were assumed to pay in one lump sum. In order to estimate reliable values of all investigations, it was showed to respondents CLEARLY that bearing them caused to diminish fortune used for another purpose, the present level of education or research was not to change if scenarios had been realized, uses of contribution were limited to contents written in investigation forms, and all of scenarios were hypotheses never to be realized and so on.

Depend on the result of 2 times pre-tests subject to students, amount of money shown in investigation forms was decided 5 kinds; 100, 500, 1000, 2000, 5000 yen[*6]. Therefore, 130 patterns of investigation forms, which led by the multiplication of 26 investigations by 5 amount of money, were established throughout the survey design.

In order to make relationships between respondents and their WTP clear, investigations on respondents' attributes were conducted to all of them (Table VI). Their sense of value was questioned in category A, B, D and as was relationships between CP and themselves in category C, E.

VII. Enforcement of Investigations

In some opinions, the Individual-interview Method is suitable for the way of investigations using CVM, although it tends to require much time and money. Accordingly, in this study, investigation forms were distributed among a group of dozens respondents, giving basic

explanations such as the aim of investigations, and collected after 1 to 7 days secured for response. On this occasion, respondents were chosen at random among people shown on the Table I and the response rate of each investigation is paid attention not to be less than 15 % (Table VII).

VIII. The Analyses' Way and Results

A. The Way to Analyze WTP

In this report, significant response samples, which exclude resistant response samples from distribution samples, are selected as appropriate subjects of analyses, and the Logistic Regression Analysis is adopted as a way to estimate central values of WTP (1).

$$y = \frac{k}{1 + a * \exp\hat{}-bx} \quad (1)$$

a; coefficient, b; constant, k; the maximum value, x; approve rate (—)

Fig. 1 shows the integral curve of students' approve rate to preserve CP environments and on this occasion, various values estimated by applying formula 1 are shown in Table VIII.

B. Analysis Results

In the same process, central values of all investigations were estimated (Fig. 2). According to them, in almost all of

TABLE III
Environments Existing in Campus Selected as Subjects in Inv. Ⅲ

Inv. #	Investigation areas	Explanation about investigation areas	Main reasons to select as investigation areas
Ⅲ-1	The Dormitory of Matikane-yama	One of the dormitories of Osaka University where mainly the faculty lives. It has decrepit appearance and deficit operation.	It is located near the station and also at the foot of the Handai slope where many people pass, but these good conditions are not utilized well at present.
Ⅲ-2	Nakayama Pond	The largest pond of 3 existing in CP, used as a reservoir. Precious waterside scenes can be seen around there.	It is located along the Handai slope, which supposed to provide a waterside-space to passersby, bad condition of maintenance prevent it from being used.
Ⅲ-3	Green area next to the Building of I-go	There are many grown trees and parked bicycles around there. Some people visit there to park bicycles but not so many.	Bad states of maintenance impress untidy, regardless of locating beside the East Gate which is likely a front door of the university.
Ⅲ-4	Space next to Students Exchanging Institution	A space next to the welfare institution. Some people occasionally make use of it as a parking area or a space to exercise but not so many.	It is not utilized well although it locates beside the East Gate, just same as Inv. Ⅲ-3, and also a broad space with a fine view.
Ⅲ-5	Green area in front of the Building of Language Research	A space where many trees grow. Few people visit there although the alley is constructed.	At present, it is not utilized well regardless of its plentiful nature environments and good locations in front of the Main Street (Inv. Ⅲ-6) which is a center of CP.
Ⅲ-6	The Main Street	A street many people pass through and also park bicycles. Main buildings, many bulletin boards and gardens are along this street.	It is a center place of CP and almost all people related to the university pass.
Ⅲ-7	Namiko Garden	A historical park whose name comes from the old name of the Osaka University. Some people take lunch, rest or read books there.	Its ill condition of maintenance impresses untidy, although it has plenty of nature and located beside the Main Street just as Inv. Ⅲ-5.
Ⅲ-8	Space next to the Building of Common Education	One of places along the Main Street (Inv.Ⅲ-6) and faced to the entrance of the buildings of common education. Many people pass there and some have their club activities at this place.	Due to facing the Main Street, many pedestrian pass through, though few people make use of it.
Ⅲ-9	Green area in the corner of the ground	Place where many trees grow. Some use it to park bicycles, though it has a bad condition of maintenance.	It is located at the end of the Main Street, which means it has a role of eye-stop.
Ⅲ-10	Ubagaya Pond	Used as a reservoir. Precious waterside scenes can be seen around there.	Although it has plentiful ecosystems and history there, few people know its existence.
Ⅲ-11	The alley in front of the Ubagaya Pond	An alley of stone pavement which has abundant natural environments. Some pass this alley to take a shortcut.	Only a part of students and inhabitants utilize, and few people know its existence.
Ⅲ-12	The Building of Ex-cyberspace	The older one of the two cyberspaces built in CP. Many students use there relatively although new cyberspace was built.	Because it is opened for longer time, many students make use of it regardless of establishing the newer one. On the other hand, some who make no use of it propose to demolish it.

TABLE IV
Compositely Planned Constructions Assumed in Inv. Ⅴ

Inv. #	Plan Types	Content of Development Plans (Inv. # of developed area)	Expected MERITS Caused by Practicing the Following Development Projects	Expected DEMERITS Caused by Practicing the Following Development Projects
Ⅴ-1	Priority in Vehicles	■Found a new bus rotary after taking down the Building of Ex-cyberspace (Ⅲ-12).■Found a new paved road at the east side of CP (Ⅲ-11).■Constitute a parking lot after filling in both of Nakayama Pond (Ⅲ-2) and Ubagaya Pond (Ⅲ-10).	■ Central area of CP becomes the exclusive zones for pedestrians. ■ To secure evacuation routes in case of emergency.	■ To demolish the building of ex-cyberspace.■To fill in two ponds. ■To demolish a part of gardens.
Ⅴ-2	Priority in Bicycles	■Found a new bus rotary after taking down the building of ex-cyberspace (Ⅲ-12).■Establish a new multilevel parking for bicycles (Ⅲ-3).■Found a new parking after filling in Ubagaya pond (Ⅲ-10).■Found a new bus rotary after taking down the Building of Ex-cyberspace (Ⅲ-12).	■ To conduct regulation of vehicles traffic in CP.■To make it easier to pass by bicycles.	■ To demolish the building of ex-cyberspace.■ To prohibit parking of bicycles in the main street.■To fill in two ponds.
Ⅴ-3	Priority in pedestrians	■Found a new bus rotary after taking down the Building of Ex-cyberspace (Ⅲ-12).■Plant the main street with trees (Ⅲ-6). ■ Construct parks in spaces next to Students Exchanging Building and Common Education Building (Ⅲ-4,8).	■ Central area of CP becomes the exclusive zones for pedestrians. ■ Plentiful trees are provided there.	■ To demolish the building of ex-cyberspace.■To limit in areas where people permit to pass by bicycles.■To prohibit parking of bicycles in the main street.
Ⅴ-4	Priority in Exchanging	■Build a sports institution after taking down the Dormitory of Matikane-yama (Ⅲ-1).■Establish a life-educational institution after filling in Nakayama Pond (Ⅲ-2).	■To promote residents' utilization of CP environments.■To establish institutions effectively many people requested.	■ To fill in a part of the pond. ■ To demolish the dormitory.
Ⅴ-5	Master Plan Type	■Found a new bus rotary after taking down the Building of Ex-cyberspace (Ⅲ-12).■Found a new paved road and bus rotary jointly at the east side of CP (Ⅲ-9,11).■Establish a promenade as a symbol of CP (Ⅲ-4-8).	■ Central area of CP becomes the exclusive zones for pedestrians. ■ To secure evacuation routes in case of emergency.■To make a symbol of CP.	■ To demolish the building of ex-cyberspace.■To lose a part of gardens such as SNamiko Garden.

TABLE V
SCENARIOS USED IN THE INV. # 1, 2, 3

Inv. #	Scenario
I	The university plans to conduct the following developments, ■to persons concerned to the university (students and the faculty); to build a new high-rise CP after demolishing the present CP ■to inhabitants around CP; to move CP to another places and develop where CP used to be to a residential area Although there are several plans to make it possible to preserve CP environments in a present condition, being lack in university's own funds or government subsidy prevents them from practicing. In order to conduct these plans, it is necessary to collect contributions.
II	The university plans to collect funds because lack of university's own funds or government subsidy causes ill conditions of maintaining CP environments. If it practices, it becomes possible to maintain a present condition.
III	The university plans to conduct developments bellow at 12 investigation areas showed in TABLE. 3. In order to practice another plan to prevent them, it is necessary to collect funds because of being lack in university's own funds or government subsidy, Though if it happens; it becomes possible to preserve these areas in a present condition.
	Developments the university is assumed to plan in the Inv. III
III-1	To be a vacant lot by demolishing the dormitory
III-2	To make a new vacant lot by filling in the pond in order to improve limitation of site area in CP
III-3	To construct it to a new vacant lot in order to improve limitation of site area in CP
III-4	The same as above
III-5	The same as above
III-6	To pave it with asphalt completely.
III-7	The same as the Inv. III-3
III-8	The same as the Inv.III-3
III-9	The same as the Inv.III-3
III-10	The same as the Inv.III-2
III-11	To pave it with asphalt after dismantling stone pavements completely.
III-12	The same as the Inv. III-3

investigations, values shown by students are the highest of the three, while some developments or environments are concluded to deserve no payment at all.

The factors having influences to appraised values are verified by estimating central values on each attribute. In this report, focused on WTP for preservation of CP environments (Table IX), the following results are obtained.1) In common to all of three, respondents who have experiences of volunteer activities show higher appraised values.

2) It is clarified that students who have participations in club activities show higher values, and also that those of the university shows higher values than the graduate school, despite of less remarkable interrelations between their grades and WTP.

3) In occasion of the facility, conspicuous relationships are not showed at any attributes because of many numbers of resistant respondents.

4) In case of inhabitants around CP, the closer they connect to CP environments or the longer time they lead their lives around CP for, the higher values they tend to show.

5) In any of three, place of residence, annual incomes and members of family influence rarely to appraised values.

At the viewpoint of preserving CP environments, the following is obtained.

1) Over 50% respondents agree to preserve CP environments.

2) The reasons why respondents AGREE to preserve CP are mainly composed of evaluating environments existing in CP such as ponds or gardens (Table X).

3) Some respondents disagree to preserve CP mainly because they agree to the scenario which means reconstruct CP to a new one (Table XI).

TABLE VI
CONTENTS OF ATTRIBUTE INVESTIGATIONS

Classification	Students	The Facility	Inhabitants around CP
A	Department Grade	Type of job Length of one's service Age	Age
B	Club Activities	Experiences of volunteer activities	
C	Way of living	Area of residence Members of family	Members of family Way of living
D		Income	
E	The number of times in a week to visit CP Average time to stay in CP in a week	The number of times in a week to visit CP Average time to stay in CP in a week	Relatives concerned to the university Recognition of CP Uses of CP environments
	Institutions or places making use frequently		

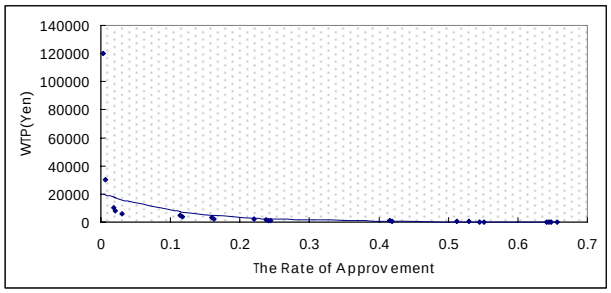


Fig. 1 The Curve of the Approve Rate on Students' Evaluation of CP Environments

C. Investigation of Reliable

In order to investigate how reliable estimated values are, their consistence with tendencies expected generally is considered, whose results are the following.

1) In case of inhabitants, the more times they visit to CP or the closer relationships to community their lives have, the higher values are shown.

2) In case of students, higher values tend to be shown by those who have opportunities to enjoy CP environments through their club activities or who stay in CP to have all classes that the university encourages to take.

3) Some students who stay in CP for far longer time than usual

TABLE VII
THE SAMPLE DATA OF ALL INVESTIGATIONS

Inv. #	Ⅰ	Ⅱ	Ⅴ-1	Ⅴ-2	Ⅴ-3	Ⅴ-4	Ⅴ-5
The Number of Distribution Sample	1282	1272	1147	1137	1147	1137	1137
The Number of Response Sample	693	676	580	578	580	578	576
The Number of Significant Response Sample	647	644	492	517	501	510	511
The Number of Resistant Response Sample	53	91	72	82	75	83	83
The Rate of Resistant Response Sample	8.2%	14.1%	14.6%	15.9%	15.0%	16.3%	16.2%
The Response Rate	50.5%	50.6%	42.9%	45.5%	43.7%	44.9%	44.9%

Inv. #	Ⅲ-1	Ⅲ-2	Ⅲ-3	Ⅲ-4	Ⅲ-5	Ⅲ-6	Ⅲ-7	Ⅲ-8	Ⅲ-9	Ⅲ-10	Ⅲ-11	Ⅲ-12
The Number of Distribution Sample	2158	1888	1902	1888	1888	1902	1888	1902	1888	1888	1902	1902
The Number of Response Sample	1026	898	892	898	898	892	900	892	896	900	892	892
The Number of Significant Response Sample	971	843	795	827	823	779	814	771	816	814	767	764
The Number of Resistant Response Sample	80	56	62	41	63	68	41	42	45	31	66	42
The Rate of Resistant Response Sample	8.2%	6.6%	7.8%	5.0%	7.7%	8.7%	5.0%	5.4%	5.5%	3.8%	8.6%	5.5%
The Response Rate	45.0%	44.7%	41.8%	43.8%	43.6%	41.0%	43.1%	40.5%	43.2%	43.1%	40.3%	40.2%

TABLE VII
VALUES OF FORMULA ON STUDENTS' PRESERVATION OF CP ENVIRONMENTS

coefficient a	constant b	maximum value k	standard deviation	value of F	value of P
5.210071	-9.27807	132000	0.245518	91.13001	0.0000

ones, mainly for the purpose of struggling to research, tend to have fewer interests in CP environments.

4) In case of the faculty, most of their responses signify that it suppose to be right to decide at discretion of the university, their employer, so that their WTP are confirmed no tendencies at all.

In these circumstances, CVM investigations conducted in this study come to a conclusion to be relatively trustworthy, because results of investigations appropriate to the matters which expected easily in advance of practicing investigations.

IX. ESTIMATION OF TOTAL APPRAISED VALUES

A. Total Appraised Values of Each Settled Investigations

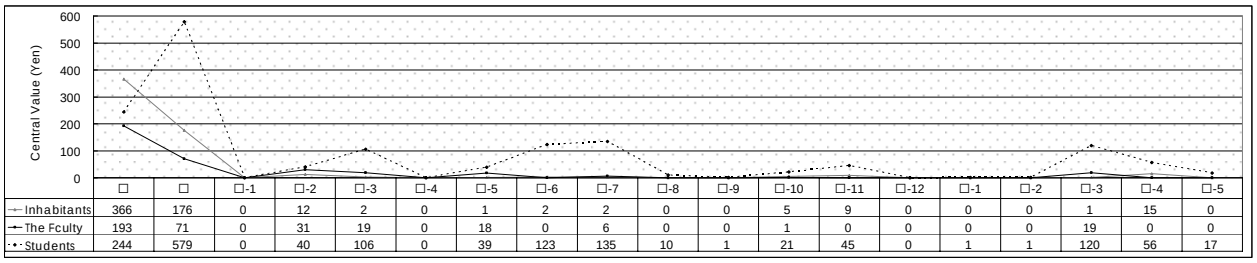
In order to prevent affection of excessive values caused by ethical satisfactions of donation, central value is considered to be appropriate to estimate total appraised values (2).

$$TAV(Yen) = M(S)*T(S)+M(F)*T(F)+M(I)*T(I) \quad (2)$$

M(S); Central Value-Students, M (F); -the Faculty, M (I); -Inhabitants

T(S); Total Number-Students, T (F); -the Faculty, T (I); -Inhabitants

As a result, it is gained that direct utility value of CP environments occupy almost all of total value; the former, which is calculated 10,355,000 yen, is equal to 97%of the latter calculated 10,586,000 yen. And it is also gained that Namiko Garden (Inv. Ⅲ-3) shows the highest value of 12 cases of environments existing CP (Fig. 4).



	□	□	□-1	□-2	□-3	□-4	□-5	□-6	□-7	□-8	□-9	□-10	□-11	□-12	□-1	□-2	□-3	□-4	□-5
Inhabitants	366	176	0	12	2	0	1	2	2	0	0	5	9	0	0	0	1	15	0
The Fculty	193	71	0	31	19	0	18	0	6	0	0	1	0	0	0	0	19	0	0
Students	244	579	0	40	106	0	39	123	135	10	1	21	45	0	1	1	120	56	17

Fig. 2 The Central Values of WTP on All Assumed Investigations

TABLE IX-I-II-III
THE CENTRAL VALUES OF EACH ATTRIBUTE; 1; STUDENTS, 2; THE FACULTY, 3; INHABITANTS

*1	Students (244, 324) *2	Attributes	Central Values (YEN)	The Percentage of Each Attribute*3
A	Grade	The 1st	203	48.5%
		The 2nd	377	17.3%
		The 3rd	442	17.3%
		The 4th	29	6.0%
	Students	University	205	89.0%
		Grad. School	152	10.1%
	Dept.*4	Law	174	23.5%
		Economy	240	36.9%
		Literature	1574	5.1%
		H. Science	869	5.1%
		I. Science	*5	0.3%
		Science	277	8.0%
		Pharmacy		0.3%
		Engineering	156	16.1%
		E. Science	153	4.5%
	Course	The Humanities	238	70.5%
		The Science	142	29.2%
B	Club Activities	Y	268	61.9%
		N	179	37.2%
	Volunteer Activities	Y	553	24.4%
		N	128	73.5%
C	Area of Residence	Within 1km	263	45.5%
		N. Osaka	365	13.7%
		C. Osaka	373	9.2%
		S. Osaka	437	5.7%
		Other Pref.	143	23.2%
	Way of Living	With Parents	184	46.4%
		Single	215	52.4%
D	Monthly Income (Yen)	0-10,000	334	15.5%
		1-30,000	250	22.0%
		3-50,000	423	19.0%
		5-100,000	320	18.5%
		10-150,000	393	5.1%
		15-200,000	81	2.4%
		Over 200,000	52	1.8%
E	Number of Times to Visit CP (per Week)	1-3	286	5.4%
		4	1066	8.0%
		5	243	61.0%
		6	133	18.5%
		7	295	5.7%
	Average Time to Stay in CP (per Week)	Under 10	131	8.3%
		10-20	281	21.7%
		20-30	239	28.9%
		30-40	1034	14.3%
		40-50	6	8.9%
		50-60	223	6.5%
		Over 60	330	6.0%

*1	The Faculty (193, 63)	Attributes	Central Values (Yen)	The Percentage of Each Attribute
A	Types of Job	Teaching Staff	156	32.3%
		Working Staff	282	58.5%
		Temporariness		7.7%
	Length of Years under his /her Service	Under 1	72	12.3%
		1-5	171	27.7%
		5-10	57	15.4%
		10-20		12.3%
		20-30	2049	12.3%
		Over 30	1361	13.8%
B	Age	In Twenties	197	18.5%
		In Thirties	95	36.9%
		In Forties	165	16.9%
		In Fifties	1377	21.5%
	Volunteer Activities	Y	472	18.5%
		N	135	80.0%
C	Area of Residence	Within 1km	865	21.5%
		N. Osaka	117	26.2%
		C. Osaka	190	20.0%
		S. Osaka		7.7%
		Other Pref.	80	18.5%
	Members of his /her Family	Single	29	18.5%
		Married Couple		24.6%
		3-4	935	35.4%
		Over 5	731	13.8%
D	Annual Income (Million Yen)	Under 2	83	18.5%
		2-4	700	18.5%
		4-6		16.9%
		6-8	635	23.1%
		8-10	583	18.5%
		Over 10		4.6%
E	Average Time to Stay in CP (Per Week)	Under s20	1013	9.2%
		20-40	105	24.6%
		40-60	193	52.3%
		Over 60	93	13.8%

*1	Inhabitants (366, 260)	Attribute	Central Values (Yen)	The Percentage of Each Attribute
A	Age	In Twenties		2.7%
		In Thirties	113	10.6%
		In Forties	191	13.4%
		In Fifties	310	19.2%
		60-74	650	40.1%
		Over 75	920	11.3%
B	Volunteer Activities	Y	422	24.7%
		N	409	66.4%
C	The City of Residence	Ikeda	514	8.9%
		Toyonaka	372	77.7%
		Mino	399	12.7%
	Distance to CP	Within 500m	387	75.0%
		Over 500m	290	25.0%
	Member of his /her Family	Single	379	4.1%
		Married Couple	837	34.2%
		3	253	21.6%
		4	179	20.2%
		5	55	11.3%
		Over 6	2779	5.8%
	Way of Living	Own House	395	93.5%
		Rental House	153	4.8%
D	Annual Income (Million Yen)	Under 2	79	7.5%
		2-4	966	14.4%
		4-6	847	15.8%
		6-8	413	9.9%
		8-10	406	7.5%
		Over 10	843	11.6%
E	Relatives Connected to Univ.	Y	764	16.4%
		N	334	81.2%
	His/her Position*6	Students	756	9.9%
		Teaching Staff	7263	2.1%
		Working Staff	2363	1.4%
	Recognition, Uses of CP	Y, Y	445	82.2%
		Y, N	203	15.1%
		N, N		3.1%

The Legend

Classification of Color	Central Values (Yen)
	700-1000
	1000-2000
	Over 2000

*1 Refer to the classifications line of Table VI.
*2 The value in parentheses shows the central values and the number of significant response samples in order.
*3 It means the ratio of number of each attribute to the total number of significant response samples.
*4 H. Science; Human Science, I. Science; Information Science
E. Science; Engineering Science
*5 In case of being statistically insufficient for the number of significant response samples, which means being lack in reliability, so central values were not calculated.
*6 If respondents have some relatives concerned to the university, his/her concrete position in the university is also subject to response.

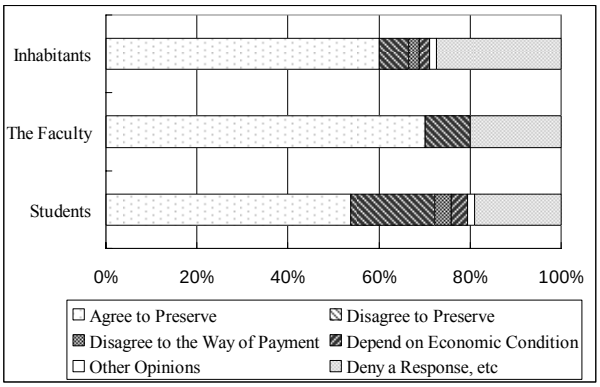


Fig. 3 the Approval Rate on Preservation of CP Environments

Based on results from investigation Ⅴ, total appraised values of entire CP environments after having conducted plural constructions mean those of values expected at present. Although it is supposed to be natural to estimate values which are expected after all of constructions are completed, it has much difficulty to assume that all constructions of this study are completed at the same time and also that commodity prices or sense of values snever change at all throughout constructions period. Thus, values expected at a point of investigation decided to be investigated.

TABLE X
REASONS WHY RESPONDENTS AGREE TO PRESERVE CP ENVIRONMENTS

Classification of Reasons	Students	The Faculty	Inhabitants
Approve of ENVIRONMENTS	14.0%	13.8%	31.2%
Approve of Advantage in CONVINIENCE	3.0%	0.0%	1.7%
SUBJECTIVE Reasons	4.5%	0.0%	4.1%
It Promotes Public Interests Especially for Communities and Students	2.1%	7.7%	2.7%
DISAGREE to the Scenario	7.4%	6.2%	4.5%
CONDITIONAL Agreements	4.2%	1.5%	2.1%
The Amount of Present Money is ECONOMICALLY Under their Tolerance Level	7.4%	12.3%	1.7%
Agree to Preservation, though DISAGREE to Contribute Money	4.2%	7.7%	4.5%
Others	6.5%	6.2%	2.4%

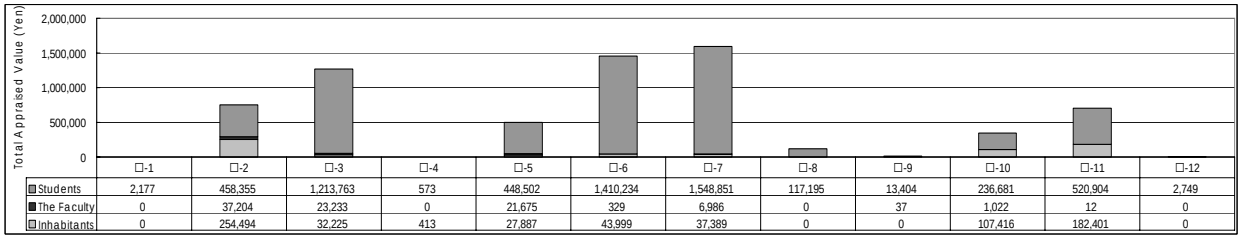
TABLE XI
REASONS WHY RESPONDENTS DISAGREE TO PRESERVE CP ENVIRONMENTS

Classification of Reasons	Students	The Faculty	Inhabitants
Subjectively, It Impresses Them BADLY	4.8%	0.0%	0.7%
It Has ILL Effects on General Environments	0.0%	1.5%	0.0%
AGREE to the Scenario	9.5%	6.2%	2.7%
NO Relationships to CP	1.5%	0.0%	2.1%
Others	2.7%	0.0%	0.3%

In the investigation Ⅴ, expected present values of direct utility in CP where plural constructions are completed were calculated. Those of entire environments in CP were estimated by applying to expression 3 which means to use a ratio of present total value calculated in Inv. Ⅰ to present direct utility value calculated in Inv. Ⅱ.

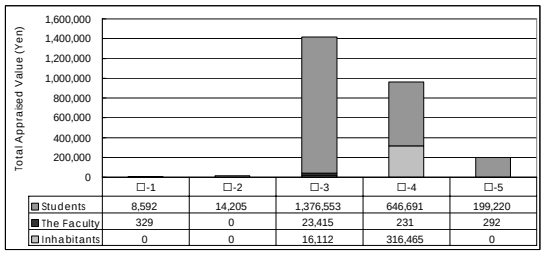
$$Td(C) = Ud(C) * \frac{U(C)}{T(C)} \quad (3)$$

T(C); Total Appraised Value of CP Environments Calculated in Inv. #1
U(C); Utility Value of Directly Use of CP Environments Calculated in Inv. #2
Td(C); Total Appraised Value of CP Environments after Development
Ud(C); Utility Value of Directly Use Calculated in Inv. #5



	□-1	□-2	□-3	□-4	□-5	□-6	□-7	□-8	□-9	□-10	□-11	□-12
Students	2,177	458,355	1,213,763	573	448,502	1,410,234	1,548,851	117,195	13,404	236,681	520,904	2,749
The Faculty	0	37,204	23,233	0	21,675	329	6,986	0	37	1,022	12	0
Inhabitants	0	254,494	32,225	413	27,887	43,999	37,389	0	0	107,416	182,401	0

Fig. 4 Total Appraised Values of the Investigation Ⅲ



	□-1	□-2	□-3	□-4	□-5
Students	8,592	14,205	1,376,553	646,691	199,220
The Faculty	329	0	23,415	231	292
Inhabitants	0	0	16,112	316,465	0

Fig. 5 Total Appraised Values of the Investigation Ⅴ

As a result, the plan type of priority in pedestrians (Inv. Ⅴ-3) gains highest value of all, while the plan type of priority in vehicles (Inv. Ⅴ-1) or bicycles (Inv. Ⅴ-2) gains lower values because these plans are suggested to take advantage for a smaller number of CP users (Fig. 5).

B. Relative Evaluations of CP Environments at Present and after Developed

In occasions of development plans assumed by capturing entire CP environments at a long-term point of view, it is clarified that which plan type is supposed to improve the present value of CP environments the most. For this purpose, the ratio of expected values of CP environments with some development completed to values of CP environments existing at present which calculated in Inv. Ⅰ is defined as "value improving rate (VIR; the following)", and plan types whose rate is over 1.0 are considered to improve CP environments compared with present condition(4).

$$VIR(-) = \frac{Td(C)}{T(C)} \quad (4)$$

However, every values led by the expression 4 are remarkably low, which considered to accrue the Political Part- Whole Bias[*7] [11]. Owing to fix and minimize them, expression 5 is formulated by using revision values.

$$VIR(-) = \frac{Td'(C)}{T(C)} \quad (5)$$

$$Td'(C) = T(C) - \sum T(e) + Td(C)$$

Td'(C); Total Appraised Value after Developments Using Revision Value
T(e); Total Appraised Value of Developing Area Calculated in Inv. #Ⅲ

Compared to present values, it is clarified that plan type of priority in exchanging (Inv. Ⅴ-4) improves environmental values and those of master plan (Inv. # Ⅴ-5) decreases them. It is also considered that the other plan types, whose calculated rates are under 1.0, will come to improve environmental values if only a part of construction contents are changed (Table XII).

Considering to the total appraised values estimated in chapter 8-1 (shown in Fig. 5), plan type of priority in exchanging (Inv. Ⅴ-4) should be the first one to practice, likewise. In the case of plan type of priority in pedestrians (Inv. Ⅴ-3), regardless of its high appraised value, the rate is under 1.0, because practicing these developments is supposed to lost plenty of environments. On account of making the rate over 1.0, which means to improve environmental values, it is considered necessary to reexamine where to develop. On the other hand, plan type of priority in vehicles or bicycles is clarified that their rates are near 1.0 while their appraised values are extremely low, because both of development plans' value and environments' value lost by developments is low. At the point of improving CP environments, this suggests that whether developments are practiced or not, it makes less difference and, in addiction, less advantages in aspect of cost- effectiveness. Therefore, these plans are not advisable to practice in the actual budget for constructions. Considering the circumstances mentioned above, development plans improving environmental value of CP are specified in aspects of total appraised value and VIR.

TABLE XII
THE VALUE IMPROVING RATE OF DEVELOPMENTS

Inv. #	T(C) (Yen)	∑T(e) (Yen)	Revision Value =T(C)-∑T(e)	Td(C) (Yen)	Td'(C) (Yen)	VIR (—)
Ⅴ-1	10,586,198	1,798,490	8,787,708	8,575	8,796,283	0.831
Ⅴ-2	10,586,198	347,869	10,238,329	12,205	10,250,534	0.968
Ⅴ-3	10,586,198	2,841,963	7,744,235	1,452,127	9,196,362	0.869
Ⅴ-4	10,586,198	377,203	10,208,995	886,640	11,095,635	1.048
Ⅴ-5	10,586,198	5,879,699	4,706,499	200,331	4,906,830	0.464

Ⅹ. CONCLUSION

Throughout this study, various environments and constructions assumed in CP are quantitatively evaluated at viewpoints of those who are blessed with CP environments and also verified from various angles. Consequently, the following knowledge is obtained.

1) Most people mainly appreciate utility value of directly use of CP environments.

2) Environments to preserve in the future is clarified through relative evaluations among environments existing in CP.

3) In case of constructions planned at a long-term view, the same above is obtained.

4) Relative evaluations of development plans make it clear that which one is considered to improve CP environments the most.

In order to utilize CVM as an effective means to evaluate environments or projects, selections of respondents or response rates should be thoroughly deliberated. Particularly in the case of applying to CP, respondents are required to recognize that all of investigations are based on assumptions, and present conditions other than environments, such as educational levels, are never fluctuated if the scenario was practiced, and so on. Specifying in national or public universities, in order to minimize the number of resistance responds, it is advisable to explain assumed conditions that subsidy from the government is insufficient to practice scenarios' content.

FOOTNOTES

***1** It means values which come from direct using of certain environment in some way. Total value of environments is able to classified into 6, such as the utility value of direct use, which is gained by making direct use of environments in some way, or the utility value of indirect use, which is gained trough literatures or pictures of environments, or the inheritance value, which derived from possibilities of using those environments by posterity(Y Aoyama "Environmental Economics of City Amenity" 2003). In case of CP environments, taking lunch in the garden, taking a walk, and attending lectures using classroom are considered to use CP environments directly, which lead to occur the utility value of direct use.

***2** CVM (Contingent Valuation Method) is defined as a way to evaluate quantitatively something ordinary not having market by constructing suspected market, which is conducted to inquire how much one can bear to make assumption called scenario possible to be realized or prevent them from realizations. This amount of money is called WTP (Willingness to pay), fluctuating of WTP caused by various factor is called an occurrence of bias.

***3** The Osaka University of Foreign Studies will be integrated into the Osaka University in September 2007.

***4** Japanese unit of distance; 1km = 1,000m = 3280.84feet= 1,093.61yard = 0.621mile

***5** Developments the university planed to conduct in the future were prescribed in it, which was based on results of surveys subject to students, the faculty and inhabitants around CP held in 2005.

***6** Japanese monetary unit; EUR/JPY=163.78, USD/JPY=120.64 (March, 2007)

***7** Respondents assume policies with more comprehensive or partial content than investigators intend.

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Kuriko Iwai was born in Osaka, Japan in 1983, studied architectural planning and urban planning at the University of Osaka, and earned a bachelor's degree of Eng. Dep. in 2006.

She is in her 1st grade of graduate school of the Osaka University, and researches environmental management of facilities and economic method of evaluating environments. Ms. IWAI is a regular member of societies such as Architectural Institute of Japan, the City Planning Institute of Japan.

Michihiro Kita was born in Osaka, Japan in 1945, studied architectural planning and urban planning at Osaka University, and earned Dr. Eng. at Osaka University in 1999.

He is an Associate professor of Architectural and Urban Planning Theory, Graduate School of Engineering, Osaka University. He worked for Nikken Sekkei as an Architect from 1990 to 1993, and has been studied at Osaka University since 1993. He is the author of other publishers; "Transaction between social and physical environment in constructing activities of residential environment," Osaka University Press, Osaka, Japan, 2004, He researches design of residential environment and environmental management of facilities.

Dr. Kita is a regular member of societies such as Architectural Institute of Japan, the City Planning Institute of Japan, Japan Association for Planning Administration, and so on.

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