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CONSENSUS BUILDING FOR CONFLICT BETWEEN INFRASTRUCTURE CONSTRUCTION AND PRESERVATION OF HERITAGE BY USING CVM

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Abstract: Recently, the conflicts between infrastructure development and preservation of social environment such as cultural heritage are increasing. To solve this problem, public forums are necessary. However, it is almost never possible to listen to all public opinions and recommendations. One of the techniques to settle issue in forum is a social survey with a questionnaire on neutral ground. This paper aims to make discussion easier by quantitatively analyzing people's views when in conflict, and determining how to effectively quantify them by focusing on developing a process to mitigate conflict among the Mugishima Castle Evaluation Committee (MCEC) members. To study this matter, two types of questionnaires were carried out. The first questionnaire is about valuing cultural heritages and discontent for infrastructure delay using contingent valuation method (CVM). The second questionnaire aims to examine the effective of committee participation and CVM questionnaire among committee members.

Key Words: CVM, CSA, PI, conflict, consensus building

1. INTRODUCTION

It is necessary to be careful in developing the area where cultural heritage lies under the ground because the importance of cultural heritages is more and more recognized lately. On the other hand, infrastructure construction is commonly associated with economic growth in an area. Since both the cultural heritages and the infrastructures have backing of public opinions, it is difficult to solve the conflict among them. In this regard, a government tends to be involved in the consultation meetings or the workshops (WS) about plans of public works. This view has been already generally, and many researches have cleared the effect of public involvement (PI) for WS and meetings. (Matsuda and Ishida, 2000, 2002, Sakano, Aiba and Satoh, 2000, Matsubashi, 2004)

In WS and consultation meetings, people often have different views and opinions, and this fact occurs their conflict. It is very difficult to solve this problem by mere discussions among participants. It is thought one of the techniques for settling these problems that the social costs of conflicting things are estimated using quantitative method, like contingent valuation method (CVM). By quantifying these in a common unit, context for discussions are solid and conflicts are easier resolved. This paper aims to examine the effect to show the quantified social cost to committee participants. To study this matter, this paper focus on the discussion of the Mugishima Castle Evaluation Committee (MCEC) which held public consultations to mitigate the conflict between project involving infrastructure constructions and preservation of castle relics.

A lot of papers have evaluated cultural heritage using CVM. These studies indicated that CVM can estimate cultural heritages values. (Parumog, Primitivo, and Mizokami, 2003), Kakiuchi and Mishimura, 2004) However, most of them only estimate the values of cultural heritages, and do not use the result of CVM in the process of consultation, discussion or conflict resolution. Especially, when the quantified results are discussed as a decision of the policy, like this case, it might be important to understand what influence the presented publics from the result. In the consensus building on the policy, Fujii explained the utility of CVM as the communications tool. (Fujii, Suda, Nishida, and Kitamura, 2002) Moreover, he thought it is a problem that to grope the CVM concrete use method as a support technique of the consensus building. Therefore, it is thought that the accumulation of a feature case like this case is important to use the quantified public opinions effectively.

This paper is structured as follows. In chapter 2, the details of the case study are explained. Chapter 3 describes how contingent valuation (CV) survey was done and its results. In chapter 4, the effect to show the quantified social cost to committee members is examined. Finally, some conclusions are offered in chapter 5.

2. INFRASTRUCTURE AND CASTLE RELICS PROBLEM

2.1 The Details of Infrastructure and Castle Relics Problem

The Mugishima castle relics, which were buried by an earthquake in 1619, have been excavated during the construction of road and storm sewer in Mugishima Area, Yatsushiro City, Japan. This incident brought up the problem of the way to go about the preservation of excavated castle relics in view of the road and the storm sewer project. The conflict was laid between Mugishima Area residents who desire to construct the infrastructure and the preservation group who desires castle relics protected. To solve this conflicting problem, the Yatsushiro City government formed the Mugishima Castle Examination Committee (MCEC) including the conflicting parties.

The road construction in Mugishima Area was decided in 1950. Construction permit for the road was obtained in 1960, and the road was planned to be completion until 1998. Moreover, since this area is a sandbank, storm sewer was simultaneously constructed with the road construction.

While infrastructure constructed, the parts of the Mugishima castle relics were excavated in 1965. After the excavation of them, the site was declared as important cultural property. Then, excavation investigation was also carried out simultaneously with infrastructure construction. Then, the Mugishima castle relics were excavated in 1996. Since an ancient castle structure is left under the ground, they are expected to solve the mystery of how the castle was built. Many people from all over Japan are visiting this relics, and hopes this area becomes the important historical place in the future.

The construction period was extended twice to investigate the relics. Thus, the completion was delayed for six years. Historical chronology of the infrastructure planning vis-à-vis castle relic preservation is shown in Table 1.

Table 1. Historical Circumstances of Infrastructure and Castle Relics

Infrastructure		*Mugishima castle relics*	
Time	*Event*	*Time*	*Event*
1950	The plan was determined	1965	The parts of castle was excavated ↓ Mugishima Area was declared as important cultural property
1960	Construction permission was obtained	1996	The Mugishima castle relics was excavated ↓ Various artifacts are being excavated
1998	Completion schedule		

There are four problems associated with the construction of infrastructure and the preservation of relics. These are as follows.

1) The road is already completed except for the section where castle relics were excavated.
2) The planed level of the road is lower than the top of the castle relics.
3) The main enclosure of the castle is removed because of the storm sewer constructed under the road.
4) Immense additional cost and further construction delay will be yielded when construction methods of the road and the storm sewer are changed to preserve the castle relics.

2.2 The Mugishima Castle Evaluation Committee (MCEC)

The Mugushima Castle Evaluation Committee (MCEC) is consist of the following groups: (1) *Residents group* which are representatives of Mugishima Area residents, (2) *Castle interest group* which are members of preservation group of the Mugishima castle relics, (3) *Neutral position group* which are neutral position of conflict, such as they are academic standings selected from the outside of culture or construction fields. (4) *Culture group* which are members of Division of Culture in Yatsushiro City; and the (5) *Construction group* which are members of the Bureau of Construction in Yatsushiro City. The culture group and construction group are the secretariat of the committee.

The MCEC members discussed how to go about preserving the excavated castle relics in view of the road and the storm sewer project in three meetings. The discussed contents in these three meetings were as follows.

The first committee meeting – Since the beginning of this meeting, a conflict between *Residents group* and *Castle interest* group was evident. *Residents group* clearly lobbies for the construction of road and storm sewer while *Castle interest group* pushes for the preservation of the castle relics. Since a compromise could not be reached, the *Neutral position group* recommended a questionnaire survey to elicit an opinion from the general publics. However, the value of the infrastructure and the castle relics were not defined in general. Contingent valuation (CV) survey, which can evaluate non-value goods, was recommended. The committee members agreed to implementation of a questionnaire.

The second committee meeting - In this committee, *Residents group* and *Castle interest group* opposed the questionnaire survey. *Residents group* said ‘since we got signature about the planning of the road and the storm sewer from 90% of the Mugishima Area residents, the questionnaire survey don’t need no longer.’ *Castle interest groups* further said, ‘since it is impossible to quantify a value of the cultural heritage, the questionnaire survey is

meaningless.' However, the neutral parties still required the CV survey because it is necessary to acquire not only the MCEC members' opinions but also opinions of general publics. At last, the MCEC members decided the CV survey, and they discussed the contents of the questionnaire. After this committee, the CV survey was carried out.

The third committee meeting – In the beginning of this meeting, the results of CV survey were explained. The MCEC members discussed based on the results, but *Residents group* and *Castle interest group* conflict could not be mitigated. Therefore, the MCEC members came to an exceptional conclusion. It was written in a suggestive paper of the MCEC to preserve the castle relics and construct the road and the storm sewer immediately. This suggestive paper was submitted to Yatsushiro City government.

After the committee meetings, *Residents gro*up and *Castle interest group* reached a consensus suddenly. They suggested that the local government has to construct the road and the storm sewer without breaking the Mugishima castle relics. Yatsushiro City government complied with their request, and decided to amend the planning of constructions because of preserving whole the Mugishima castle relics under the ground.

3. CV SURVEY METHODOLOGY AND RESULTS

This chapter explains about application and calculation of CV survey, and the decision of Yatsushiro City government is evaluated by using CVM results.

3.1 Application to CV Survey

As the chapter 2 showed, there are two opinions in this conflict problem. One opinion is 'we want preservation of the castle relics (preservation priority)' and other opinion is 'we want the infrastructure construction (construction priority).' It is therefore necessary to consider both 'the value of castle relics' and 'the value of discontent for delaying infrastructure construction' for calculation and comparison. However, if the same person were asked the both values, he might estimate the value of his opposite priority low. The respondents are classified according to priority in first question (See Q.A in Figure 1). Then, the respondents classified as preservation priority go to the question about preservation of the excavated castle relics (See Q.B in Figure 1), otherwise go to the construction priority question about the value of discontent for construction delay (See Q.C in Figure 1). Question Q.B is based on double-bounded dichotomous choice CV (Bishop and Heberlein, 1979), and question Q.C is based on the conjoint analysis (Louviere, 1988). Details of the questionnaire design are shown in Figure 1.

The CV survey was executed from November 7th to 22, 2002. The questionnaire was randomly distributed to 500 households within Mugishima Area and 1000 households within Yatsushiro City out of Mugishima Area (we call this area 'Yatsushiro City' simply).

Q.A
Select the number of the statement that is the closest to your opinion among the construction of infrastructure and preservation of the excavated castle relics in Mugishima Area.

1 The excavated castle relics have to be preserved, and the infrastructure construction has to be stopped.
2 The excavated castle relics preservation has to be the priority, and the infrastructure construction has to be changed.
3 The infrastructure construction has to be the priority, and the excavated castle relics preservation should be controlled.
4 The infrastructure construction has to be gone ahead, and excavated castle relic has to be record preservation.

You selected **1. or 2.** to **Q.B** You selected **3. or 4.** to **Q.C**

Q.B
If the area of the Mugishima castle relics (about 14ha) was purchased and improved historical park, you would have to pay special tax for this park improvement to five years. Please reply to the following question about Mugishima castle relics park improvement.

Q.B-1
You have to pay special tax for Mugishima castle relics park improvement. This charge of your household is **(set from 5 bid amounts) yen/mouth**. **Are you willing to pay it?** Please consider that if you pay it, you could not pay other expenditures.

1. Yes **2. No**

You selected **1. Yes** to **Q.B-2** You selected **2. No** to **Q.B-3**

Q.B-2 How about if you have to pay **(higher bids than Q.B-1) yen/month**. Are you willing to pay it?

1. Yes **2. No**

Q.B-3 How about if you have to pay **(lower bids than Q.B-1) yen/month**. Are you willing to pay it?

1. Yes **2. No**

Q.C
If the construction of road and storm sewer were changed, the situations would be happened as following table. Please select the most you want and second one, then enter the number on ____. However the performance of septic tank for combined waste water is **not** inferior than public sewerage system one, the charge of it is higher **(set from 5 bid amounts) yen/years** than public sewerage charge.

Situations	*Road construction*	*Storm sewer construction*	*Sanitary wastewater measures*
1	Complete in 2004 (Present plan)	Complete in 2014 (10years late)	septic tank for combined waste water
2	Complete in 2009 (5years late)	Complete in 2004 (Present plan)	septic tank for combined waste water
3	Complete in 2014 (10years late)	Complete in 2004 (Present plan)	public sewerage system
4	Complete in 2009 (5years late)	Complete in 2009 (5years late)	public sewerage system

The most desirable situation _____ The second desirable situation _____

Figure 1. Questionnaire Sheet of CV Survey

3.2 CV Survey Results

The response rate of the CV survey was over 75 % in both Mugishima Area and Yatsushiro City. The analysis of the each question answer is as follows.

Question Q.A
In Question Q.A, the answer with construction priority is 74.7% in Mugishima Area, and is 60.3% in Yatsushiro City. The answer for Q.A. is shown in Table 2.

Table 2. The Answer for Q.A

Choices	Preservation priority 1	Preservation priority 2	Construction priority 3	Construction priority 4
Mugishima Area	22	80	165	136
	102 (25.3%)		301 (74.7%)	
Yatsushiro City	46	261	290	176
	307 (39.7%)		466 (60.3%)	

Question Q.B (Value of castle relics)

This paper used random utility model (Hanemann, 1984) for willingness to pay (WTP) to value of castle relics preservation. It is assumed that C yen as special tax is necessary to preservation of the castle relics. $\Delta V(C)$ is the difference in utility with and without paying C yen. $\Delta V(C)$ can be expressed by log function model in equation (1).

$$\Delta V = \alpha - \beta \ln C \tag{1}$$

The probability of replying yes for the special tax is shown in equation (2) when the random terms are assumed Gumbel Distribution.

$$\Pr ob(Yes) = \frac{e^{\Delta V(C)}}{1 + e^{\Delta V(C)}} \tag{2}$$

The WTP for the castle relics and estimated parameters are shown in Table 3. Since Mugishima Area WTP is a result in the limited area, Yatsushiro City WTP is used to calculate value of the castle relics. The special tax (WTP) has been paid for five years. Therefore, each household has to pay the tax total 21,900 yen. As the result of question Q.A, 40 % households of Yatsushiro City agreed to pay the tax, and there are 37,700 households in Yatsushiro City. Accordingly, a total WTP is calculated about 340 million yen in Yatsushiro City. Moreover, it expected that people out of Yatsushiro City are also willing to pay for the castle relics. Considering whole Kumamoto prefecture, if 30-40% of all 671,500 households agree to pay the special tax, total WTP will be about 4.41-5.88 billion yen.

Table 3. WTP for the Castle Relics Results

Parameter	**Mugishima Area**		**Yatsushiro City**	
	Estimate	**t-statistic**	**Estimate**	**t-statistic**
α	-0.88	9.04	-1.19	9.04
β	0.99	13.02	1.18	13.02
N		**307**		**307**
log-likelihood		**383.63**		**383.63**
WTP（Mean）（yen／household・month）		**365**		**411**

Question Q.C results (Value of discontent for delaying infrastructure construction)

The construction priority respondent selected the most desirable situation (choice i) and second one (choice j) in 4 situations.

The utilities for each situation are formed by three variable which are X_1:Delay of road construction, X_2:Delay of storm sewer and, X_3:Charge of septic tank for combined waste water. This utility model is expressed in equation (3).

$$V_i = \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} \tag{3}$$

The probability of replying selected the situations i and j is expressed equation (4) when the random terms are assumed Gumbel Distribution.

$$P_{ij} = \frac{e^{V_i}}{\sum_k e^{V_k}} \frac{e^{V_j}}{\sum_l e^{V_l}} \quad , i \notin l \tag{4}$$

It is expected that infrastructure construction delay effects Yatsushiro City much lesser than Mugishima Area. Therefore, WTP of discontent for delaying infrastructure construction is calculated only Mugishima Area. The estimated parameters of discontent by infrastructure construction delay in Mugishima Area are shown in Table 4. In this paper, WTP for discontent by road construction delay (WTPR) is expressed $k\beta_1 / \beta_3$, and WTP for discontent by storm water measures delay (WTPS) is expressed $k\beta_2 / \beta_3$. k is compensation coefficient for discount rate and lifecycle of septic tank. In case discount rate is 4% and lifecycle of septic tanks is 30 years, WTPR is estimated 156,000 yen/household/years and WTPS is estimated 88,000 yen/household/years. There are about 3,400 households in Mugishima Area and about 2,000 households of them are influenced by infrastructure construction delay. Since about 75% of Mugishima Area households have discontent about infrastructure construction delay from Q.A results, total WTPR is about 340 million yen/year and total WTPS is about 120 million yen/year.

Table 4. Estimated Parameters of Discontent by Infrastructure Construction Delay

Parameter	Estimate	T value
Delay of road construction β_1	-0.74	38.22
Delay of storm sewer construction β_2	-0.42	30.88
Charge of septic tank for combined waste water β_3	-0.85	25.00
N		**301**
log-likelihood		**603.22**

3.3 Analysis after evaluation of alternative plans using CVM results

Since conflicted groups reached a consensus after the committee, it is not clear whether the Yatsushiro City government decision was correct. Therefore, this section conducted after evaluation to the social costs of the Yatsushiro City government decision by using CVM results. This paper prepared 3 alternative plans to compare them. Alternative plans are *present plans* desired by residents group, *full preservation plan* made by the opinion of cultural interest group and *decision plan* decided by Yatsushiro City government after the MCEC. The details of plans are shown in Table 5.

Table 5. Details of Alternative Plans

Substitution plans	Present plan	Full preservation plan	Decision plan
Aim	The road and the storm sewer are construct, and the castle relics are not preserved	Change the construction of road and storm sewer, and all the castle relics are preserved	Change the construction of road and storm sewer, and all the castle relics are preserved under the ground
Delay in infrastructure construction	0 year	(Road) 5-10 years (Storm sewer) 10years	0 year
Castle relics	Not preservation	Full preservation	Preservation underground
Road	No change	Change the planed level and thickness of the road	Raising road maximum 80cm, and compress thickness till of road a little 40%
Storm sewer	No change	Change plan and detour castle relics	Construct under 7m of castle relics by siphon

Each social cost of substitution is estimated in following. First, in case of the present plan, this social cost will only come from the castle relics destroy. Therefore, total social cost of the present plan is about 340 million yen in Yatsushiro City, and about 4.41-5.88 billion yen in Kumamoto prefecture. Second, in case of the full preservation plan, this social costs come

from the delay of infrastructure construction and option costs by construction change. Since lifecycle of the septic tank for combined waste water is 30 years and discount rate is 4-5%, social cost of delaying the road construction is about 1.77-4 billion yen, and social cost of delaying the storm sewer construction is about 1.17-1.3 billion yen. Moreover, the road option cost is 1.8 billion yen, and storm sewer one is 10 billion yen. Accordingly, total social cost of the full preservation plan is about 14.71-17.1 billion yen. Finally, in case of the decision plan, though the cost of preserving the castle relics under the ground should be included in social cost of the decision plan, it is much less than the social cost of the castle relics destroyed. Therefore, the social cost of preserving the castle relics under the ground is estimated as 0 yen. Accordingly, this plan's social cost comes from only the option cost, and it is about 300 million yen. These social costs are shown in the Table 6.

Table 6. Social Costs of Substitution Plans (in yen)

Substitute plans		Present plan	Full preservation plan	Decision plan
Social cost of destroying castle relics	Yatsushiro City	340 million	0	0 (Though Use Cost is not 0 yen, it is much littler than Existence Value)
	Kumamoto	4.41-5.88 billion	0	
Social cost of delaying infrastructure construction	Road	0	1.77-4 billion	0
	Storm sewer	0	1.17-1.3 billion	0
Others	Option cost	0	(Road) 1.8 billion (Storm sewer) 10 billion	(Road) (Storm sewer) 300 million
Total cost		**Yatsushiro City 330 million** **Kumamoto 4.41-5.88 billion**	**14.71-17.1 billion**	**300 million**

It is appeared that social cost of the decision plan is the smallest by the comparing social costs of alternative plans. It is seemed that monetary term of public opinions by using CVM were made the best use for the decision of Yastushiro City government. Moreover, since the MCEC members also were affected the quantified public opinions, the following two surmise are thought as a background of their consensus. The first surmise is "the MCEC members realized that they couldn't get the public consent only by sticking their own opinions." The second surmise is "the MCEC members understood the results of the quantified public opinions."

4. SURVEY ON PARTICIPATION IN THE COMMITTEE EFFECTS AND ON CV SURVEY EFFECTS

In this chapter, two surmises arisen in Chapter 3 are analyzed. The questionnaire was brought to the MCEC members to verify them. This questionnaire introduced the following two questions. The first question shows whether committee participation affected change of the opinion of members. The second question shows whether CVM results affected the members. The former question studies the first surmise, and the latter one studies the second surmise. This questionnaire was distributed to all 33 MCEC members on January 2004, and this survey's responses were 32.

4.1 The Committee Participation Effect

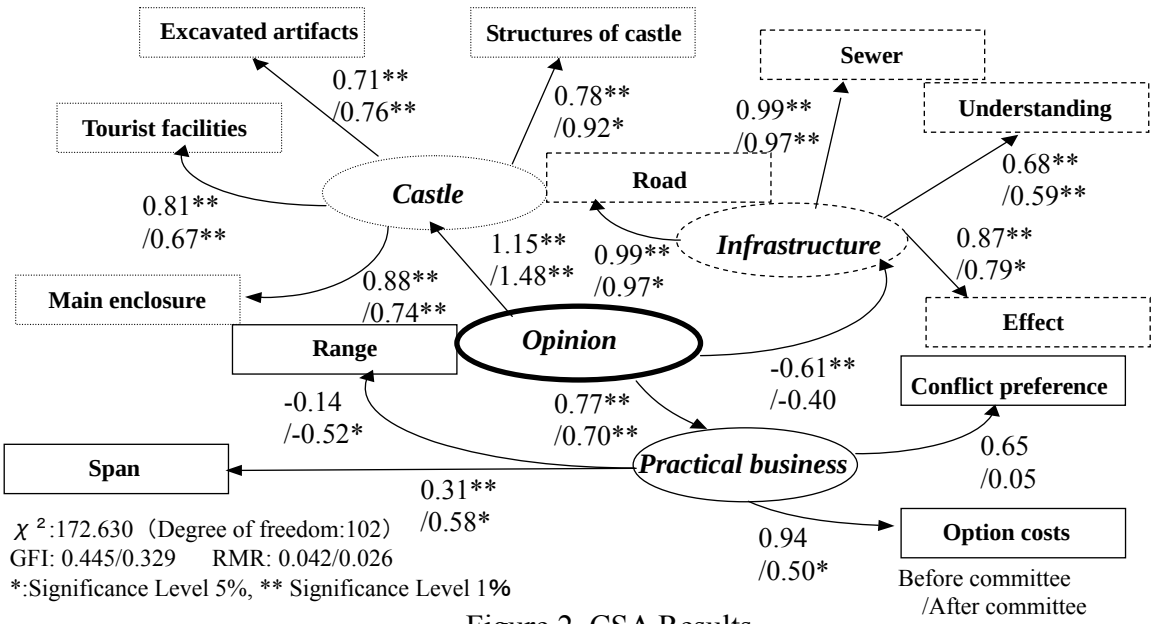
(1) The change of all members' opinions

The points of discussion are extracted from contents of the MCEC committee to show the effect of the committee participation. The points of discussion are classified under 3

categories, *Castle*, *Infrastructure*, and *Practical business*. *Castle* category have relation to the Mugishima castle relics, *Infrastructure* category have relation to the construction of road and storm sewer, and *Practical business* include the other points of *Castle* and *Infrastructure* category. Each category includes 4 factors respectively, and these points are considered the factors that affect the members' opinions. This paper supposes that the MCEC members' structures of consciousness were represented 12 factors, 3 categories and "*Opinion*" as like Figure 2. 12 factors are observed variables, and 3 categories and "*Opinion*" are latent variables. In this questionnaire, the committee members were asked these factors' questions on special 7 levels which range from 1- extremely agree to 7-extremely disagree. The factors were analyzed by Covariance Structure Analysis (CSA), and the results of these were compared before and after committee results. Then, the effect of committee participation is considered from the amount of each factor's change. "+" means the influence of the factor gives on members' opinion increased, and "-" means the influence of it decreased. The question of CSA survey and CSA results are shown in Table 7 and Figure 2.

Table 7. The question of CSA survey

Category	Factors	Questions
Castle	Structures of castle	What did you think about the value of the excavated structures of the Mugishima castle?
	Excavated artifacts	A lot of artifacts are excavated from the Mugishima castle excavation site. If the plan which these artifacts are exhibited is proposed, what did you think about you judged it?
	Tourist facilities	Many people came to the Mugishima castle excavation site from all over Japan. What did you think about a possibility that Mugishima castle relics can be tourist facilities?
	Main enclosure	What did you think about the value of the main enclosure of the castle ?
Infrastructure	Road	What did you think about relation between road construction and castle excavation investigation?
	Sewer	What did you think about relation between storm sewer construction and castle excavation investigation?
	Understanding	What did you think about your understanding of residents' requests?
	Effect	What did you think that how about the effect of this infrastructure?
Practical business	Conflict preference	What did you think about the conflicting opinions against yours?
	Option costs	How did you get the option costs occurred by infrastructure construction change?
	Range	What did you think that how many people are effected by this conflict problem?
	Span	What did you think that how long this problem are effective?



χ^2:172.630（Degree of freedom:102）
GFI: 0.445/0.329 RMR: 0.042/0.026
*:Significance Level 5%, ** Significance Level 1%

Figure 2. CSA Results

The numerical value and these differences (after committee results – before committee results) are arranged in Table 8. In this paper, it is considered that over 0.2 value change (bold value in Table-8) are large. It showed two considerations as follows.

Table 8. Differences of CSA Results

Factors	Before	After	Diff.	Factors	Before	After	Diff.
Castle				**Infrastructure**			
Structures of castle	0.900	1.360	0.461	Road	-0.607	-0.388	0.219
Excavated artifacts	0.815	1.123	0.308	Sewer	-0.606	-0.388	0.218
Tourist facilities	0.934	0.990	0.055	Understanding	-0.415	-0.237	0.178
Main enclosure	1.009	1.094	0.086	Effect	-0.532	-0.316	0.215
Practical business							
Conflict preference	0.499	0.038	-0.461	Range	0.239	0.408	0.169
Option costs	0.725	0.349	-0.375	Span	-0.105	-0.365	-0.259

All of *Castle* category factors for *Opinion* changed "+", and the change of 'Structures of castle' and 'Excavated artifacts' were especially large. This change means the influence 'Structures of castle' and 'Excavated artifacts' which the factors of Mugishima castle excavated gave to *Opinion* of the members has increased greatly. However, the influence of 'Tourist facilities' and 'Main enclosure' increased extremely small. In short, it is seemed that the members' opinions changed greatly only into the preservation of the castle relics from concrete use and the preservation method of them. All of *Infrastructure* category factors for *Opinion* changed "+", and almost they were the same value. In short, the members recognized the some importance of the construction of road and storm sewer by participation in the committee. On the other hand, all *Practical business* category factors for *Opinion* changed large "-" excluding 'Range'. It is seemed that this is because the influence of the *Castle* factors and the *Infrastructure* factors more increased than *Practical business* factors excluding 'Range' on *Opinion* of the members. Especially, 'Conflict preference' directly related to the first surmise changed into greatly "-", and it is understood that the influence given to the members' *Opinion* decreases greatly. It is seemed that the MCEC members realized that they couldn't get the public consent only by sticking their own opinions as first surmise.

In these results, it can be said that the MCEC members realized that it is important to accept the other members' opinion than a concrete content (ex. use method of castle relics, the extra cost of the infrastructure construction), and the opinion of the Mugishima castle relics and the infrastructure construction improved by the participation of the MCEC committee.

(2) The change of group opinions

The result of the CSA targeted the all MCEC members. However the MCEC members had various opinions, it is necessary to analyze a change of the opinion in each group, and the influence of the MCEC committee participation. Each group should be analyzed by CSA and their opinions changes are compared, but the number of samples is too little. Then, this paper conducted chi-square test under the null hypothesis, as it is "A group members' opinion change is the same pattern as the other group members".

$$\chi^2 = \sum_{i=1}\sum_{j=1}\frac{\left(X_{ij} - E_{ij}\right)^2}{E_{ij}} \quad \because E_{ij} = \frac{X_{i\cdot} \cdot X_{\cdot j}}{N} \tag{5}$$

Xi. of expression (5) means the number of a group members (*i*=1,2). *X.j* means the number of members who did a certain opinion change pattern (*j*=1,2,3) ("+", "-", and "0"). In short, *Xij* means the number of a group member who did a certain opinion change pattern. Moreover, *Eij* is expected value in *Xij*, and *N* is the number of total sample (Total replies of members are 32). "The same pattern as the other group members" in null hypothesis means that the same opinion change pattern ("+", "-", and "0") on results of CSA (CSA results means all members opinion change pattern). Therefore, it conducted chi-square test whether a group members' opinion change is the same as the other group members' opinion change, and the uniqueness of a group opinion change is defined. This result was showed in Table 9.

Table 9. Chi-square Test Results of Each Group

Group	**Castle**				**Infrastructure**				**Practical business**			
	Structures of castle	Excavated artifacts	Tourist facilities	Main enclosure	Road	Sewer	Under -standing	Effect	Conflict preference	Option costs	Range	Span
Residences	1.81	1.52	0.39	3.34	1.29	3.27	2.74	0.31	2.39	2.32	1.45	1.15
Castle interest	1.66	0.71	0.18	1.12	0.83	1.12	*6.40	*8.53	0.81	1.08	1.88	*15.71
Culture	1.85	5.59	1.15	1.95	3.70	1.03	5.62	1.57	1.71	2.68	0.40	1.53
Construction	1.66	*6.40	0.17	2.08	3.51	1.38	3.73	4.80	2.34	1.99	0.21	2.15
Neutral position	0.15	1.10	5.34	1.73	1.30	1.73	0.51	0.30	0.40	2.75	0.24	1.50
Opinion change pattern	+	+	0	0	+	+	+	+	-	-	+	-

* : Degree of freedom 2, Significance Level 5% 5.99

The null hypothesis of *Castle interest group* members of 'Understanding', 'Effect', 'Range', and *Construction group* members of 'Excavated artifacts' are dismissed. In *Castle interest group*, their opinion change into the necessity and effect of the construction of road and storm sewer, and period spent on problem mitigation are different from other members. 'Understanding' and 'Effect' of the CSA results opinion change pattern are "+", 'Range' pattern is "-". This opinion change is interpreted that they recognized to require time to fund the castle relic preservation and to understand other group members by the committee participation. Moreover, *Construction group* showed a different the opinion change from other members for the exhibition at 'Excavated artifacts'. This CSA results the opinion change pattern is "+". They had thought that it was satisfied only to record castle relics. However, the castle would preserve under the road after the MCEC committee ends. Therefore, it seemed that they thought it was not necessary to be preserved till the excavated article. In these results, it is showed that the most MCEC members' opinion changed a same pattern by the participation of the committee though the opinion change pattern is partially different. Especially, the opinion in 'Structures of castle', 'Road', and 'Sewer' that related directly to the castle relics and the infrastructure construction which were the main part of this conflict problem in Mugishima changed a same pattern. In short, all recognized their importance. It seems that this showed members compromise by "The construction of road and storm sewer that doesn't loss the value of castle relics". Moreover, 'Conflict preference' is all group are same opinion change pattern. Therefore, it can be said that the first surmise applies to all groups.

4.2 The Effect of CVM Results

The questionnaire about the effect of CVM results is shown in Table 10. These questions were extracted from CV survey results which might effect the member opinions. This question asked the committee members on the common 7 levels questions which are ranges from 1-extremely agree to 7-extremely disagree. This paper used the replies that 1 to 3 levels replies are 'agree' and 5 to 7 level replies are 'disagree'. This paper used results of Q4 (Defined public opinions by quantifying) and Q6 (CVM questionnaire difficulty) to study effect of CVM results. These results of each group are shown in Table 11.

Table 10. CVM Results Questions for the Committee Members

Q1	Did you expect that many publics don't know the Mugishima castle relics?
Q2	Did you expect that Mugishima Area residences whose 90% signed about the infrastructure construction replied to want to preserve the Mugishima castle relics in their 25%?
Q3	Did you expect that 60% of Yatushiro City publics replied to want to construct the infrastructure?
Q4	Did you think that publics opinions were defined by quantifying them in monetary terms?
Q5	Did you get some information except for Q1 to Q4?
Q6	Is it difficult for you to understand the results of CV questionnaire?

Table 11. Q4 and Q6 Results

Groups	*Q4: Defined public opinions by quantifying*									*Q6: CVM questionnaire difficulty*								
	1	*2*	*3*	*4*	*5*	*6*	*7*	*Total*	*Average*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*Total*	*Average*
Residences	0	0	0	0	1	3	0	4	5.75	0	1	2	0	1	0	0	4	3.25
Castle interest	0	0	2	0	0	0	0	2	3.00	0	1	0	1	0	0	0	2	3.00
Culture	2	3	1	2	0	3	0	11	3.36	0	2	1	2	3	2	1	11	4.45
Construction	0	1	4	3	2	1	1	12	4.08	0	2	8	2	0	0	0	12	3.00
Neutral position	0	0	0	1	1	1	0	3	5.00	0	0	2	0	1	0	0	3	3.67
Total	2	4	7	6	4	8	1	32	4.06	0	6	13	5	5	2	1	32	3.59

Q4 result (Defined public opinions by quantifying)

The 'agree' replies and the 'disagree' replies are various by each group. Especially, *Resident group* tend to disagree. On the other hand, *Castle interest group* and *Culture group* show the tendency to agree. As a whole, the replies rates of agree and disagree are just same at 13. In short, the half of members accepted the effect of CVM results.

Q6 result (CVM questionnaire difficulty)

Since the reply rate of 'agree' is 60%, and 'disagree' is 25%, it seems that it is difficult for the members to understand the results of CVM questionnaire. In replies of each group, all groups thought CVM questionnaire was difficult of understanding excluding *Culture group*. In short, the members thought the results of CVM questionnaire are difficult.

The evaluation of the quantified public opinions by CVM is various opinions depending on the MCEC members' group. However, the half member replied the agreement to the quantified public opinions by CVM though about 60% of them thought that the results of CVM questionnaire were difficult of understanding. In these results, it can be said that the quantified public opinions affect the MCEC members' opinion though it can't be said that the member understood the results of them as second surmise.

5. CONCLUSION AND RECOMMENDATIONS

This paper applied CVM to quantifying public opinions to Mugishima castle relics and the construction of road and storm sewer, which became the object about the conflict problem in Mugishima. Then, the discussion of basing the CVM result made the change for MCEC members' opinions of the castle relics and the construction of road and storm sewer. It is described to have understood from this study as follows.

- The definitive plan of Yatsushiro City government, which was decided in consideration of a compromise of the MCEC members, are also preferable for the members from social costs calculated by CVM.

- The MCEC members realized that they couldn't get the public consent only by sticking their own opinions.

- The most members' opinions changed a same pattern by the participation of the MCEC committee.

- All members recognized Mugishima castle relics and the construction of road and storm sewer to be important by the participation of the MCEC committee.

Therefore, it can be said that the quantified social cost intentionally influenced the MCEC committee members in this case. However, the resident group members replied a remarkably negative to two questions that was brought to the MCEC members. It seems that the low CVM recognition of the public is greatly influenced. In short, it seems that it was difficult for them to understand the questionnaire technique which has never been known, and they couldn't trust the result. The opinion of the publics who are not participating the discussion will be able to be used more effectively by a lot of results like this case are piled and get the publics' understanding to "Quantified social cost" widely in the future.

REFERENCES

a) Books and Books chapters

Kuriyama, K. (1998), **Environmental Value and Valuation Method**, Hokkaido University Press

b) Journal papers

Fujii, S., Suda, H., Nishida, S., Kitamura, R. "CVM for Procedural Justice and Consensus Building" **Infrastructure Planning Review, Vol.19 No.1**, pp99-103, 2002,

Kakimoto, R. and To, Y. (2004), The application of CVM to the confrontation between infrastructure improvement and preservation of the ruins, **Journal of the City Planning Institute of Japan, No.39-3** 403-408

Kakiuchi, E. and Mishimura, Y. (2004), Quantitative evaluation of cultural capital using CVM -The case study of the world heritage village of Gokayama, Toyama-, **Journal of the City Planning Institute of Japan, No.39-2** 15-25

Matsubase, K. (2004), A report on a city planning workshop with 1.000 publics participats -Through the "Dialogue with the city" forum in Perth metropolitan area-, **Journal of the City Planning Institute of Japan**, No.39-3 331-336

Matsuda, W. and Ishida, H. (2002), A study for effective public involvement in the Ushiku City master plan process, **Infrastructure Planning Review, Vol.19, No.3,** 129-136

Michelle G. Parumog, Primitivo C. CAL , and Mizokami, S. (2003), Using travel cost and contingent valuation methodologies in valuing externalities of urban road developmentn: An application in valuing damages to cultural heritage, **Journal of the Eastern Asia Society for Transportation Studies, Vol.5**, October, 2003, 2948-2961

c) Papers presented to conferences

Matsuda, W. and Ishida, H. (2000), The effects of public involvement activities and information on citizen's consciousness of the master plan process, Paper on **City Planning Institute, No.35, CPIJ** 871-876

Sakano, Y., Aiba, S. and Satoh, S. (2000), A study about inffluence in workshops for community planning -A method for analysis about the development of workshop and the changes of participation's consciousness-, **City Planning Institute, No.35, CPIJ** 13 - 18

To, Y. and Kakimoto, R. (2004), Study on mitigation of conflict between infrastructure construction and preservation of heritage by using CVM, **Proceedings of Infrastructure Planning, Vol.30,** University of Yamaguchi, Japan, 21-23 November, 2004

d) Other documents

Board of Education in Yatsushiro City (2002) **The Record of 1st Mugishima Castle Committee**

Board of Education in Yatsushiro City (2002) **The Record of 2nd Mugishima Castle Committee**

Board of Education in Yatsushiro City (2002) **The Record of 3rd Mugishima Castle Committee**