

User attitude towards traffic control in Shiretoko and Daisetsuzan National Parks in Japan

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Abstract: Vehicle traffic control has been introduced as a countermeasure to over-use in various natural parks of Japan. Users' understanding is indispensable for enforcing vehicle traffic control. Thus, the present traffic control system must be examined based on an evaluation from the viewpoint of visitors. Kohgen area of Daisetsuzan National Park and Kamuiwakka area of Shiretoko National Park in Hokkaido (northern island of Japan) were chosen for case studies. Data were collected by a mail-back questionnaire survey for visitors of these areas in 1999–2001. The results showed that most visitors approved or supported the traffic control systems. Approval ratings of vehicular traffic control were closely related to the visitors' acceptability of inconvenience by the control. The visitors' acceptability of the inconvenience was closely related to the length of period under the vehicular traffic control, and interval between shuttle buses. The parameters of the investigation included the timing of the survey. Approval ratings were higher within the restriction period than outside. The study confirmed that there were some elements to which the relationship to the traffic control approval were steady or unstable according to the investigation year. This finding strikes a note of warning about discussing significance levels from data acquired over a single year.

Preface

Over-use affects not only the natural environment but also the quality of the visitor experience. As the number of users increases, vegetation becomes destroyed; the numbers of naturalized plants increase, overcrowding leads to frustrated and dissatisfied users, and wild animals that travel during the night are negatively influenced. Moreover, the following phenomena influence the quality of the visitor experience (Katoh 1997, The Oze Preservation Foundation 1998, Environment Agency 1997, Kobayashi 2000). The appearance of bustle and long traffic jams causes frustration manifested as increased annoying behavior, increased unpleasantness, and obstruction of the achievement of objectives.

Problems associated with increasing use have been repeatedly discussed including capacity from the viewpoint of capping the number of users (Seta 1974, Katoh 1997, Nakajima 1998). These problems are associated with access improvement and increased car usage.

Plans for park use should be implemented when it is necessary to control visitors' behavior (Environment Agency 1997). The objective of such plans is to harmonize the increase in recreational use with the conservation of natural landscape and ecosystem.

The Environment Agency provided the "Outline of measures for correcting car use in Natural Parks" to deal with problems associated with the increasing

number of private cars in natural parks (1974). The total number of visitors to 28 Japanese national parks increased from 380 million to 410 million after 1990. By 2000, traffic control had been introduced into 17 areas of 13 parks, with considerably positive effects.

Restrictions are required because too many parked cars on the roadside cause traffic jams in popular districts during high season (Yui & Furuya 2001). Therefore, vehicular traffic has been controlled at times of concentrated use. A substituted mode of transportation has been established in 14 of 17 areas.

Factors affecting approval of vehicle traffic control could be identified based on users' attitude toward the control. The present study examined factors affecting users' support for and understanding of the need for traffic control. Kamuiwakka area of Shiretoko National Park and Kohgen area of Daisetsuzan National Park were chosen for this case study where traffic has been controlled since 1999 and 1997, respectively. The factors included in the investigation were selected based on data gained from a three-year survey that was started in 1999.

Outline of the investigated areas

Kohgen area of Daisetsuzan National Park

The area surrounding the Kohgen hot springs is considered a showplace of autumn colors where visitors can walk around varied ponds. Most users visit with private cars because no regular bus presently oper-

ates. Because walking the trails takes about 4 hours to complete, cars remain parked for long time. The capacity of the parking lot at the entrance to the hiking routes is only near 50 cars. Therefore, the lot becomes full at about 6.30 a.m. when the autumn leaves are in full color. Visitors who arrive thereafter park on the shoulder of the approach road that considerably narrows access, leading to traffic jams. These become remarkable on weekends and national holidays from the middle to the end of September. Traffic control was introduced to solve these problems in 1997. Private cars have been diverted to a temporary parking lot on the Daisetsu Lake site, and shuttle buses have been provided. The controlled region comprises an 8 km section that extends from the junction of National Road 278 (Figure 1). About 90 percent of the annual visitors to the park arrive during September. The bus transfer costs 300 yen (about \$3 US) and it takes about 15 minutes. Shuttle buses for Kohgen Hot Springs operate from a temporary parking lot from 06:30 to 12:30 every 30 minutes. When the number of visitors is too high to be transported, extra shuttle buses can be organized at short notice according to the situation. A tape in the bus explains details about the natural environment and the manners of recreational use during transportation to Kohgen Hot Spring. Vehicles excluded from the control included sightseeing buses, cars driven by guests staying at Kohgen Hot Springs Hotel, and cars driven by climbers except those on day trips. Vehicular traffic control has been enforced by the coalition for the five days every year that comprise national holidays, a Saturday and a Sunday since 1997 from the middle of September to the beginning of October. The maximal and minimal numbers of users per day were 1550 during the investigation period and 179, respectively.

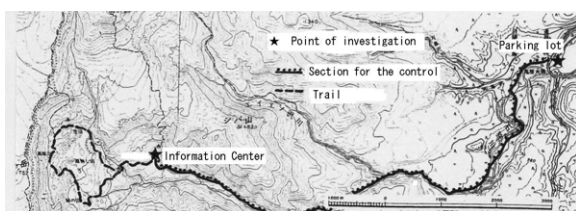


Figure 1. Case study of Kohgen area in Daisetsuzan National Park.

Kamuiwakka area in Shiretoko National Park

The number of visitors to Shiretoko National Park was about 400,000 in 1980 before the Shiretoko Crossing Road over Shiretoko-Pass was opened. The number of visitors increased during the 1980s as a base for tour sightseeing, and it has stabilized at about 2.3 million since 1990. Buses and private vehicles afford the main types of access to this National Park. About 70% of all annual visitors arrive between April–September of (as of 2000), and thus are most concentrated during the summer. When traffic con-

trol was originally considered in 1991, a “Liaison council” was established that consisted of representatives of the Environmental Agency, Hokkaido Prefecture, the town of Shari, the local police, the Tourist Association, and a fishery co-operative. The road network is limited by the geographic nature of Shiretoko peninsula. The flow of visitors can be easily controlled due to cul-de-sacs and the simplicity of the road network.

Vehicular traffic control was originally started for 16 days from July 26th – August 10th in 1999. The controlled 12 km section stretches from the junction of Shiretoko-Goko (five lakes) to the Kamuiwakka River (Figure 2). Bicycles and public vehicles were exempt from controls. The period of traffic control was extended to 23 days between July 29th – August 20th in 2000 and from July 28th – August 19th in 2001. Visitors to the Kamuiwakka area have to transfer to a pay shuttle bus at Shiretoko Nature Center. The Nature Center is located about 20 km from Kamuiwakka, so the shuttle bus takes about 50 minutes to arrive. The single fare is 590 yen (about 5 dollars) and the bus operates every 20 minutes from 07:00 to 17:40. While on the bus, visitors are given a taped explanation of the natural environment and how to behave in the park. As they alight from the bus, an instructor gives them and explains some simple notes concerning the Kamuiwakka River.

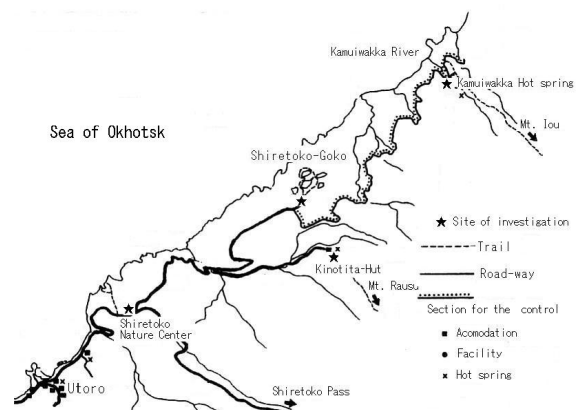


Figure 2. Study area of Kamuiwakka in Shiretoko National Park.

Data and method

Method of attitude survey

Visitor attitudes to the vehicle controls were examined from mail-back questionnaires that were given to the visitors at the sites.

In Kohgen area, visitors were given questionnaires at the Brown Bear Information Center of the entrance to the hiking route, or at the transfer point to the shuttle bus. The day of the survey was selected considering the period of the traffic control. Visitors were asked to complete this questionnaire while boarding the shuttle bus during its hours of operation

between 06:30–12:00. In total, 2426 were distributed and 692 were completed (recovery ratio, 28.5%; proportion of total visitors, 8.9%).

In Kamuiwakka area, considering the behavior of visitors and the section under traffic control, the main sites of the attitude survey were Shiretoko Goko and Kamuiwakka. Shiretoko Nature Center and the Kinoshita hut were added considering visitors behavior in alternate years. The first shuttle bus arrives at Kamuiwakka at 07:54, and the last departs at 18:33. Therefore, the investigation proceeded between 08:30–15:00. While visitors were boarding the return shuttle bus, they were asked to cooperate with the survey. In total, 8224 surveys were distributed, 2267 were completed for a recovery ratio of 27.6%. Because the content of the questionnaire differed somewhat according to the investigation year, the relationship to traffic control was limited to questions that addressed issues that were identical common over three years.

Investigation parameters

In the Kohgen investigation, questions addressed the time of the investigation (n=2 questions), individual attributes (n=6), traffic controls (n=10), motivation for visiting (12), parameters access to traffic control information (n=14), parameters for content valued in the Kohgen-Numa round trail (n=10), problems regarding facilities (n=7), and excessive use (n=3). The chi-square test analyzed relationships between these parameters and traffic control. In the Kamuiwakka investigation, questions addressed the time of the investigation (n=3 questions), individual attributes (n=5), traffic controls (n=3), access to traffic control information (n=14). The chi-square test analyzed relationships between these parameters and traffic control.

Result

Visitor profile

Kohgen area in Daisetsuzan National Park

The age distribution was twenties, 5.0%, thirties 14.7%, forties, 21.3% and 50 years and above, 59.0%. Males accounted for 57.3%. Visitors were

composed of groups of 3–4 persons (20.0%), pairs (49.5%) groups of five or more, 17.8% and individuals, 12.7 %. First time visitor to the Kohgen-Numa trail accounted for 16.8%, second time visitor did for 21.0%, and third or more did for 62.1%. The proportion of the total number of visitors to the area during the period under traffic control was 95.4%.

Kamuiwakka area in Shiretoko National Park

The age distribution was twenties, 21.4%, thirties, 25.9%, forties, 23.9% and 50 years and above, 28.9%. Males accounted for 60.1%. Groups were composed of 3–4 persons, 30.7%, pairs, 45.1%, five or more, 13.0%, and individuals, 11.1 %. First time visitor was accounted for 55.6%, second time visitor, 28.1%, and third time or more, 16.4%. The proportion of the total number of visitors to the park during the period under traffic control was 80.9%.

Elements and content that affect visitor attitudes towards support for vehicular traffic control

Table 1 shows relationships between these parameters and visitor approval of traffic control in Kohgen area. The significance level of 5% was found in these parameters regarding the investigation year, age of visitors, frequency of visit, prior access to information about traffic control, perception of guide board, and evaluation of countermeasures against over-use. The significance level of 1% was found in shuttle bus interval. The significance level of 0.1% was in these parameters regarding motives for viewing autumn colors, timing of the visit (presence of traffic control), visitor acceptance of inconvenience imposed by the control and opinion of the restriction period.

Table 2 shows relationships between these parameters and visitor approval of traffic control in Kamuiwakka area. The significance level of 5% was found in these parameters regarding group size, and frequency of visit. The significance level of 1% was found in both the investigation year and the point of the investigation. The significance level of 0.1% was found in, timing of visit (presence of traffic control), shuttle bus interval, opinion of the restriction period, and perception of crowding.

Table 1. Relation between each parameters and the approval of the traffic control in Kohgen area (chi-square test).

Investigation Year	Timing of visit	Age of visitors	Sex	Address	Size of group	Frequency of visit	Property of group	Motive for view of the autumn color	Perception of guide board	Evaluation of countermeasures against over-use
0.086*	0.148***	0.101*				0.089*		0.136***	0.121*	0.112*
Acceptance of inconvenience	Comprehensibility of explanation	Perception of crowding	Content of explanation	Time length of explanation	Timing of explanation	Shuttle bus intervals	Opinion of the restriction period	Type of vehicles under the control	Prior access to information about traffic control	
0.315***						0.116**	0.235***		0.100*	

***=Significant at p<.001 **=Significant at p<.01 *=Significant at p<.05

Figure in each cell is Cramer 'V

Table 2. Relation between each parameters and the approval of the traffic control in Kamuiwakka area (chi-square test).

Investigation Year	Timing of the visit	Age of visitors	Sex	Address	Size of group	Frequency of visit	Shuttle bus interval	Opinion of the restriction period	Perception of Crowding	Point of distribution
		0.081***			0.061*	0.051*	0.148***	0.384***	0.089***	0.067**

***=Significant at $p < .001$ **=Significant at $p < .01$ *=Significant at $p < .05$

Figure in each cell is Cramer's V

The approval rating for traffic control increased from 87.8% to 96.7% in the Kohgen area (Figure 3) and slightly decreased from 87.6% to 83.0% in Kamuiwakka (Figure 4) between 1999 and 2001. The secular distortion of the approval rating tended to differ in both areas.

The approval rating of the traffic control was extremely low among users who thought that the current restriction period was too long. This was common to users of both districts (Figures 5, 6).

Users who wanted more frequent shuttle service were strongly negative towards controls in both areas. In Kohgen area, the approval rating was a little low among users who requested more frequent shuttle service. With respect to shuttle frequency, the approval rating for traffic control was 93.3% among users who felt that "even 30 minute intervals would be acceptable", and 75.9% among those who might accept 10-minute intervals. In Kamuiwakka, the approval rating was low among users who wanted a higher shuttle frequency. The approval rating for the control was 88.6% among users of "even 30 minute intervals would be acceptable", and 74.9% among those who might accept 10-minute intervals.

Users who avoided the control period to visit these areas had negative attitudes towards traffic control. The approval rating for control in Kohgen and Kamuiwakka areas was 71.9% and 79.8%, respectively, among visitors outside the controlled period and 89.6% and 87.7%, respectively, among those within the period. Users who did not approve of traffic controls tended to visit during periods without traffic control.

This analysis was limited to the Kohgen area. The approval rating for vehicular traffic control was high among user who tolerated the inconvenience it imposed (Figure 7).

With regard to visitors' attitude toward countermeasure of addressing over use, the approval rating for traffic control was 93.8% among users who selected "Restricted traffic control", 89.9% among those who selected "Enlightenment and environmental education", and 70.6% among those who thought that traffic controls failed to positively impact over use.

This analysis was limited to the Kohgen area. The approval rating for the traffic control was a little higher among users who positively evaluated current advance access to information about controls.

This analysis was limited to the Kohgen area. The approval rating for traffic control was 91.2% of users who visited to "view the autumn colors" as the primary

reason for the visit and 82.3% of those who chose this as their secondary purpose reason, and 80.0% of those for whom this motivation was not an issue.

This analysis was limited to the Kamuiwakka area. The approval rating for vehicular traffic control was high among users who did not perceive crowding in Kamuiwakka.

The approval ratings for traffic control were a little low in both areas among users in their twenties. The approval rating for traffic control in Kohgen was 95.2% among users in their forties, 93.0% in their thirties, 89.0% in those over 50 and 82.4% in the twenties. In Kamuiwakka, the approval rating for traffic control was 89.2% in those aged over 50, 87.4% in the 40s, 86.3% in the 30s and 78.5% in those aged 20 and below.

This parameter tended to differ between the two areas. The approval rating for vehicular traffic control in Kohgen tended to increase with visiting frequency. The approval rating of the vehicular traffic control was 83.9% among first time users, 90.0% and 93.0% among 2nd and 3rd (or more) time users, respectively. The approval rating for vehicular traffic control in Kamuiwakka tended to vary with visiting frequency. The approval ratings for vehicular traffic control were 86.5%, 87.1% and 81.8% among first, second and 3rd (or more) time users.

Attitudes toward restricting vehicles differed in Kamuiwakka among points where visitors were asked to cooperate with the investigation. The approval ratings for vehicular control were 89.6%, 84.0%, 79.1% and 84.0% among users at Shiretoko Gobo, Kamuiwakka, Kinoshita hut and at Shiretoko Nature center.

Relationships between parameters that affect attitudes toward vehicular traffic control

Mutual relationships between parameters that significantly affect attitudes toward traffic control in Kohgen were analyzed by the chi-square test. Judging from the frequency of the significant level of 0.1%, the following parameters strongly affected the approval rating of traffic control: acceptance of inconvenience by traffic control, opinion of the restriction period, investigation year, and timing of the visit.

The chi-square test revealed a significant relationship among most parameters in Kamuiwakka, with many being at the levels of 0.1%.

In Kohgen area, the relationship between the investigation year and parameters with a significant relationship to the approval rating of traffic control

according to unified data collected over three years was examined. Frequency of visit, acceptance of inconvenience by traffic control, and timing of the visit were significantly related ($p = 0.1\%$) to the approval rating of traffic control. The relationship of the shuttle bus interval to approval of traffic control was significant ($p = 5\%$).

Non-restriction day of the investigation was included only in 1999. The ratios of users who had visited three times or more were 40.9%, 76.3% and 85.3% in 1999, 2000, and 2001, respectively. The ratios of users who accepted inconvenience imposed by the control were 71.9%, 81.4% and 88.0% in 1999, 2000 and 2001, respectively (Figure 8). The ratios of users who recognized the current shuttle bus interval as acceptable were 46.2%, 55.3% and 63.9% in 1999, 2000 and 2001.

To exclude the influence of the investigation year, the relationship to the approval rating of the traffic control was analyzed by the chi-square test separately for each year. Two patterns were recognized in statistically significant relations to the approval rating. One was detected on some year of the investigation and in others, not detected at all. The approval rating and frequency of visit in each investigation year were not correlated significantly. The following param-

eters significantly affected approval ratings in any investigation year: countermeasures against over-use, timing of visit, shuttle bus interval, age of visitors, prior access to information about traffic control, acceptance of inconvenience imposed by traffic control and opinion of the restriction period.

In Kamuiwakka area, data from three years were unified and analyzed with respect to parameters that were significantly related to approval of traffic control during each year. The following parameters significantly differed at each year: group size, opinion about the restriction period, perception of crowding at Kamuiwakka and frequency of visit.

The approval ratios of the current period of traffic controls were 29.1%, 51.3% and 56.1% in 1999, 2000 and 2001 respectively. From a social viewpoint, the period of vehicular traffic control that includes the Obon Festival was extended from 16 to 23 days from the year 2000. The ratios of being perceived the current shuttle bus frequency as acceptable was 63.6%, 69.9% and 79.9% in 1999, 2000 and 2001 respectively. The ratios of visitors being over 50 were 25.1%, 25.3% and 35.9% in 1999, 2000 and 2001, respectively. The ratios of those who visited at least three times were 27.6%, 21.7% and 19.3% in 1999, 2000 and 2001 respectively. The ratios of the

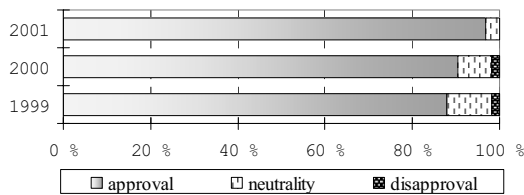


Figure 3. Approval rating of traffic control according to the year in Kohegen area.

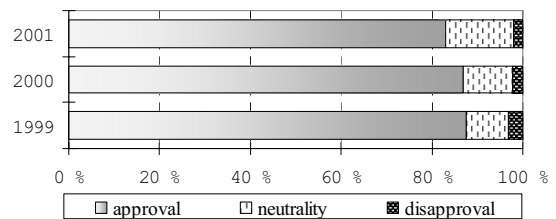


Figure 4. Approval rating of traffic control according to the year in Kamuiwakka area.

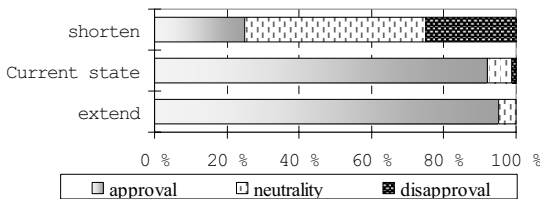


Figure 5. Approval rating according to the opinion of the restriction period in Kohgen area.

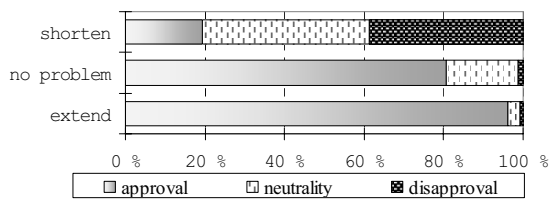


Figure 6. Approval rating according to the opinion of the restriction period in Kamuiwakka area.

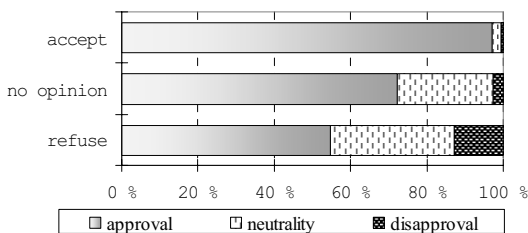


Figure 7. Approval rating according to the acceptance of inconvenience in Kohgen area.

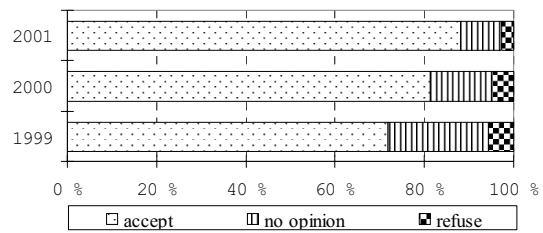


Figure 8. Acceptance of inconvenience according to the year in Kohgen area.

total user proportion within the restriction period were 84.7%, 90.9% and 67.0% in 1999, 2000 and 2001 respectively. The approval ratings were 88.6%, 87.9% and 85.9% in 1999, 2000 and 2001, respectively within and 81.8%, 77.4%, and 79.3%, respectively outside the control period.

To exclude the influence of the investigation year, the relationship between these parameter and support of vehicular traffic control was analyzed by chi-square test separately each investigation year. Three patterns were recognized: undetectable, occasionally detected and detected regardless of the investigation year. Frequency of visit was not significantly related to approval rating. Only group size, perception of crowding at Kamuiwakka, point of investigation, and shuttle bus interval were significantly related to control approval during any year. The relationship between the following parameters and approval rating of the vehicular traffic control was significant during each year of the investigation: age of visitor, opinion of restriction period and timing of visit.

Elements that affected approval rating of vehicular traffic control

In the Kohgen area, the acceptance of inconvenience imposed by vehicular traffic control and opinion of the restriction period were significantly related to the approval rating. The relationship between these and other parameters was examined. Acceptance of inconvenience imposed by vehicular traffic control was significantly related ($p = 0.1\%$) to the shuttle bus interval, timing of visit and opinion of the restriction period.

With respect to acceptance of inconvenience imposed by vehicular traffic control, the ratio of acceptance was 83.3% among those who would accept an even by 30 minute shuttle bus and 79.9% of those with no opinion ("It cannot be said either") and 46.2% of those who would like 15 minute intervals. The ratios of those who accept the current shuttle bus frequency was 46.4% and 80.0% of visitors outside and within the control period, respectively. Significant relationships to opinion of the restriction period were identified among prior access to information about traffic control and acceptance of inconvenience imposed by vehicular traffic control ($p=0.1\%$) and evaluation of countermeasures against over-use ($p = 5\%$).

In Kamuiwakka area, age of visitors, timing of visit, and opinion of the restriction period were significantly related to the approval rating of vehicular traffic

control. The relationship between these and other parameters was examined. The results of the chi-square test showed that "opinion of the restriction period", was significantly related to age of visitor and timing of visit ($p = 0.1\%$), and frequency of visit ($p = 5\%$). The ratio of those who hoped an extended restriction period was 46.3% of visitors under 20 years of age, 57.9%, 53.7% and 47.7% of those in their 30s, 40s and 50s, respectively. The desire for an extended restriction period was very low among those aged over 50 or under 20. The ratios of those who hoped an extended restriction period was 40.6% and 55.2% of those outside and within the restricted period.

Analysis of variance of approval rating of traffic control

The relationship between "approval rating of vehicular traffic control" and factors in Kohgen was examined by analysis of variance of one-way layout. Table 3 shows that acceptance of inconvenience, opinion of the restriction period, timing of the visit and shuttle bus intervals were related at a significance level of 0.1%. Viewing autumn colors and the investigation year were related at a significance level of 1%. Prior access to information about traffic control and evaluation of countermeasures against over-use, frequency of visit, and age of visitors were related at a significance level of 5%.

The following factors were combined in the two-way analysis of variance, and analyzed based on acceptance of inconvenience and opinion of the restriction period. These factors were the most significantly related according to the one-way analysis of variance (Table 4). Acceptance of inconvenience was the most closely related to the approval rating of vehicular traffic control, followed prior access to information about the traffic control, opinion of the restriction period, investigation year, viewing autumn colors, and timing of visit.

The relationship between "approval rating of vehicular traffic control" and other factors in Kamuiwakka were examined by the one-way analysis of variance. Table 5 shows that opinion of restriction period, shuttle bus interval, timing of visit, perception of crowding and age of visitor were related at a significance level of 0.1%. Frequency of visit and point of investigation were related at a significance level of 1%. Investigation year and size of group were not significantly related to the approval rating.

Table 3. Relation between the approval of the traffic control and related factors in Kohgen area (One-way layout analysis of variance).

①Investigation year	②Timing of the visit	④Age	⑥Frequency of visit	⑦Acceptance of inconvenience	⑧Shuttle bus interval	⑨Opinion of the restriction period	⑩Prior access to information about traffic control	⑫Evaluation of measures against over-use	⑬Viewing autumn colors	⑭Perception of guide board
4.8**	15.1***	3.0*	3.3*	68.6***	8.2***	36.7***	5.1*	3.2*	5.0**	
1.4	2.2	1.3	1.0	17.0	2.5	10.4	0.8	2.0	1.5	

Upper row: F value

***=Significant at $p < 0.01$ **=Significant at $p < 0.05$ *=Significant at $p < 0.1$

Lower row: contribution(%)

Table 4. Relation between the approval of the traffic control and related factors in Kohgen area (Two-way layout analysis of variance).

whole	⑦ Acceptance of inconvenience	⑨ Opinion of the restriction period	Effect of interaction
22.2***	15.7***	10.2***	2.7*
		⑩ Prior access to information about traffic control	
25.5***	47.0***	19.4***	8.8***
	⑦	① Investigation year	
21.7***	28.6***	13.8***	6.4**
	⑦	⑬ Viewing autumn colors	
23.0***	63.4***	16.6***	7.9***
	⑦	② Timing of the visit	
30.0***	32.0***	7.7**	3.6*
	⑦	⑧ Shuttle bus interval	
19.7***	55.8***	5.9**	4.6**
	⑦	⑫ Evaluation of measures against over-use	
12.0***	19.4***	4.3**	
	⑦	⑥ Frequency of visit	
16.9***	59.8***	4.6*	
	⑦	Age	
13.8***	25.8***	2.8*	
F value			
***=Significant at p<.001 **=Significant at p<.01 *=Significant at p<.05			

whole	⑨ Opinion of the restriction period	⑩ Prior access to information about traffic control	Effect of interaction
17.8***	5.8**	12.9***	6.2**
	⑨	① Investigation year	
12.2***	13.4***	7.8**	3.1*
	⑨	⑬ Viewing autumn colors	
10.6***	29.9***	3.4*	
	⑨	② Timing of the visit	
18.6***	31.5***	15.8***	5.0**
	⑨	⑧ Shuttle bus interval	
10.8***	37.6***	5.0**	
	⑨	⑫ Evaluation of measures against over-use	
9.5***	7.4***	8.1***	7.8***
	⑨	⑥ Frequency of visit	
11.7***	40.0***	7.1***	4.8***
	⑨	④ Age	
10.2***	19.7***	4.1**	

Table 5. Relation between the approval of the traffic control and related factors in Kamuiwakka area (one-way layout analysis of variance).

① Investigation year	② Timing of the visit	③ Point of distribution	④ Age	⑤ Size of group	⑥ Frequency of visit	⑧ Shuttle bus interval	⑨ Opinion of the restriction period	⑪ Perception of crowding
	11.28***	3.93**	7.03***		4.77**	31.37***	312***	9.15***
	5.2	0.5	9.4		4.3	3.9	22.9	1.3
Upper row: F value				***=Significant at p<.001 **=Significant at p<.01 *=Significant at p<.05				

Table 6 shows the results of the two-way analysis of variance that analyzed the following factors based on opinion of the restriction period, shuttle bus interval, and timing of visit. Opinion of the period was the most closely related to the approval rating of vehicular traffic control, followed by shuttle bus interval and perception of crowding.

Factors affecting secular distortion of the approval rating of traffic control

Based on the results shown, factors affecting secular distortion of the approval rating of traffic control were examined. The rating in Kohgen increased in 2001 compared with 1999 from 87.8% to 96.7%. Two or more factors affected this result. The number of annual users who can tolerate the shuttle bus interval or inconvenience imposed by the traffic control has increased. This means that the ratio of users who can accept the current conditions will increase.

When the numbers of users who tolerated inconvenience increased, the approval rating was high. Thus, an increase in the numbers of such users leads to an increase in those who approve the vehicular

control. Therefore, the approval rating of the traffic control has increased each year in this area.

The approval ratings in Kamuiwakka were 87.6%, 87.0% and 83.0% in 1999, 2000 and 2001, respectively. The approval rating of traffic control was closely related to the amount of accepted inconvenience. Evaluation of inconvenience involved "length of vehicular traffic control period" and "shuttle bus intervals". The ratio of visitors that would accept the current shuttle bus interval and period of traffic control increased every year.

The approval rating of the vehicular traffic control differed according to timing of visit, age of visitor and point of investigation. The ratios of those over 50 years of age were 25.1%, 25.3% and 35.9% in 1999, 2000 and 2001, respectively. The proportion of users within the period was 84.7%, 90.9% and 67.0% in 1999, 2000 and 2001 respectively.

Because of an increase of the ratio of visitors that accept the current state, the approval rating of vehicular traffic control should increase. However, both the proportion of users who visited within the restricted period and the approval rating of vehicular

Table 6. Relation between the approval of the traffic control and related factors in Kamuiwakka area (Two-way layout analysis of variance).

whole	③Opinion of the restriction period	⑧Shuttle bus interval	Effect of interaction	whole	③Shuttle bus interval	⑩Perception of crowding	Effect of interaction	whole	②Timing of the visit	⑩Perception of crowding	Effect of interaction
52.8***	113.1***	14.8***	3.0*								
	⑨	⑩Perception of crowding		9.9***	25.2***	6.8**		11.7***	26.2***		2.9*
45.5***	130.4***	10.8***	4.1**		⑧	④Age		5.2***	②	④Age	
64.1***	317.4***	14.7***	6.6***	7.5***	28.3***	4.0**			13.4***	4.9**	
	⑨	③Point of distribution			⑧	③Point of distribution			②	③Point of distribution	
61.9***	95.7***	7.1***	4.2***	7.9***	23.7***	4.6**	2.8**	4.3**	11.8***	2.9*	
	⑨	②Timing of the visit			⑧	②Timing of the visit			②		
120.9***	191.3***			15.9***	11.6***	4.2*					
	⑨	⑥Frequency of visit			⑧	⑥Frequency of visit			②	⑥Frequency of visit	
78.4***	258.2***	6.4**	2.6*	8.6***	25.9***			4.1**	9.2**	3.4*	
	⑨	①Investigation year			⑧	①Investigation year			②	①Investigation year	
78.4***	296.8***			11.4***	16.6***	8.2***	5.2***	2.8*	11.3***		

F value

***=Significant at $p < .001$ **=Significant at $p < .01$ *=Significant at $p < .05$

control decreased in 2001. With respect to the small decrease in 2001, the effects of both increasing and decreasing factors seemed to be counterbalanced. The approval rating was not secularly distorted if the data were limited to within the period. Therefore, the approval rating changed very little during the three years after vehicular control was introduced.

Conclusion

Visitor attitudes towards traffic control were examined in Kamuiwakka and in Kohgen where such controls have been in place since 1999 and 1997, respectively. The results showed that over 80% of users approved the control. In the Oze area of Nikko National Park, 85.4% of visitors approved and 1.2% disapproved of traffic control (Yui & Furuya 2001).

Most users approved of traffic control even though the surveys were implemented soon after the introduction of vehicular traffic control or several years thereafter. The period under the traffic control was different among the areas, being at least 90 days in Oze, 16 or 23 in Kamuiwakka, and five in Kohgen. Moreover, the management of the vehicular traffic control also differs. Regardless, the approval ratios did not significantly vary, suggesting that vehicular control has obtained the social cognition.

When vehicular traffic control is considered to force some inconvenience upon the user, I think that not only a person who agrees unavoidably but also a person who agrees positively is included in this group who approve the traffic control. Subdividing groups according to the degree of approval might more precisely identify the mental structure of users

who feel forced to accept the restrictions as opposed to those who wholeheartedly approve them.

Approval of traffic control differed in both areas according to the age of the visitors or the frequency of visiting. Approval was a little low among visitors in their twenties to both areas. This tendency can also be confirmed in Oze. Few younger people expressed a desire for an extended restriction period, indicating that this group tends not to want to tolerate inconvenience.

The approval rating of higher frequency user was high in Kohgen, but somewhat low in Kamuiwakka. A revisit attends to reflect attachment to a place, and it relates to an affirmative evaluation of the current status. The high frequency of those revisiting Kohgen is reflected in the high approval rating of traffic control. However, approval decreases when users visit Kamuiwakka three times or more. This study could not clarify the cause of this phenomenon.

The secular distortion of the approval rating was examined including related factors. The approval rating increased in the fifth year from 3rd year after traffic control had been enforced in Kohgen area. The approval rating hardly seemed to have changed since traffic control had been enforced in Kamuiwakka.

Closely related parameters to the approval rating in both areas were opinion of the restriction period, timing of visit, and shuttle bus interval. The approval rating was low among users who visited outside the restriction period, who thought that the shuttle bus interval was too long, and who wanted to shorten the restriction period. Users who tended to resist inconvenience imposed by the controls showed tended to have an attitude that would avoid inconvenience.

The proportion of the approval was high among those who accepted the inconvenience in Kohgen

though there was no question in Kamuiwakka. An investigation executed in 1992 before vehicular traffic control was enforced on Shiretoko confirmed that user attitudes to the inconvenience are related to the approval of enforced traffic control (Kobayashi 1993). These findings indicate that evaluation and response to inconvenience imposed by vehicular traffic control affect the attitude towards the approval rating. The report from Oze found that approval of the restriction correlated with "evaluation of the effect of nature conservation", "evaluation of the effect of easing congestion", and "evaluation of substitution and traffic charges", and that users who opposed the executed controls evaluated each effect as low (The Oze Preservation Foundation 1998).

Although users agreed that regulating private cars is effective, many felt an economic load from the fee, and a stress from the inconvenience (Yui & Furuya 2001). To increase visitor approval, overcoming a strong sense of resistance against inconvenience will become critical. As the Kita-Kanto District National Park and Wildlife Office (1999) pointed it out, the necessary condition it is never to add an excessive load to the user. However, higher approval ratings cannot be achieved if users do not recognize and understand the value that can be obtained at the expense of convenience. The advantages gained from the restrictions are not clearly compared with those obtained in the absence of controls so users cannot clearly recognize the need for such controls. The 1992 investigation in Shiretoko showed that users who thought that the negative influence on the environment was reduced by traffic control highly approved of traffic controls whereas the opposite was true of those who assumed that the restrictions did not affect the environment (Kobayashi 1993).

In Oze, users pointed out that information about vehicular traffic control is not widely available. Problems include the outline and content of the control, service to users, and the imposition of a fee (Yui & Furuya 2001).

The 2001 investigation at Kamuiwakka revealed that the visitors who wanted "The results of the investigation to be made public" accounted for 86.0% of respondents (Kobayashi 2001). However, not enough information is being disclosed. The purpose of the fee should be revealed, a technique for evaluating the effect brought by the control should be established, and the results should be publicized. Moreover, to extend the approval, a logical context that reflects user evaluation and demand for the system of traffic control must be established.

The subjects in the investigation technique must include the timing of the survey. Approval ratings were higher within the period under the control than outside. When approval of traffic control is investigated, respondent groups should be evaluated with respect to biases towards such approval in the area of traffic control execution during the period under control rather than the opinions of all users. Moreover, attitudes to

vehicular control differ among local populations (Watanabe 1992). Therefore, when evaluating the effects of traffic control, of the viewpoints of users during the restriction period, all visitors to the park, the local population and the manager should be categorized to understand the structure of the approval.

The present study confirmed that there were elements to which the relations to the approval of traffic control were stable or unstable according to the investigation year. Thus, the significance level of approval should not be based on results taken from an investigation of a single year.

That is, the reproducibility of the relationship is in doubt. For instance, a previous investigation (Kobayashi 2000), detected a statistically significant relationship between approval of vehicular traffic control and acceptance of inconvenience, unpleasantness of congestion and shuttle bus interval. However, such significance of was not necessarily reproduced over three years. Therefore, factors affecting stability must be identified and included in future investigations. In that sense, the problem about the technique of monitoring the user attitude survey should be instituted.

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