

Technical Note Report

AN ANALYTICAL STUDY OF CITIZENS' OPINION POLLS ON THE EVALUATION OF A ROAD CONSTRUCTION PROJECT WITH SPECIAL CONCERNS FOR THE URBAN ENVIRONMENT (A CASE STUDY OF HIKAWA SANDO IN SAITAMA CITY)

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Abstract

The purpose of this study is to compare an evaluation of a road construction project by the residents who live along the road and with those who live outside the city. The evaluation is analyzed by the CVM (Contingent Valuation Method). The outcome of the comparison is as follows: the residents who live along the road that are directly involved in the public project expect better result than the residents who live outside the city.

KEYWORDS: *citizen's participation, CVM (contingent valuation method)*

1. Introduction

1.1 The background and the purpose of this study

Recently, the number of cases has increased where citizens participate in public projects planned and implemented by a local authority from a viewpoint of collaboration between citizens and the same local authority. The local government is required to analyze the effectiveness of their investments and the benefits of their expenditure to prove effectiveness and appropriateness in the use of a limited budget in the interest of full information disclosure.

On the other hand, while everyone acknowledges the need to improve the living environment in the city, each project is evaluated by a different method. As a result, the accountability to citizens is questioned.

Under such circumstances, this study measured the effects of the NOx removal pavement with light catalyst that was conducted with the citizens' participation, examined how citizens evaluated the results of the pavement project, and analyzed if there was a difference in the opinion polls taken from residents in different areas.

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1.2 Methods of this study

This study was done on a street development project in Saitama City. The project, with an emphasis on environmental concerns, proceeded with citizens' participation. The data of the NO_x removal pavement with light catalyst before the project and the investigation data after the project were analyzed. Based on the results of the analyses, a questionnaire survey was conducted on the residents along the Hikawa Sando and the residents outside the city. By using the CVM method, the author examined if there is a difference in the assessment of the project among the residents according to the district they live in. If there are differences, factors that caused the differences will also be discussed.

1.3 An outline of the district in question

This study focuses on the Hikawa Sando, a 2km-long path approaching a Shinto shrine. The path is within walking distance from the east exit of Omiya Station in Saitama City. It is lined with trees, composing a valuable green axis in the urban area.

This path is utilized as a detour for traffic on Nakasendo Avenue. Four thousand (4,000) to 5,000 cars pass the six-meter wide street section of the path every day. Pedestrians sometimes are in danger due to illegally parked cars on the street. In order to solve such a problem, a Community Association Chairperson and volunteers that were independently working to conserve trees in the area formed the Community Development Council in 1995. The Council conducted a traffic control experiment, organized a symposium (Nakano, 2000), and made suggestions to the City about future plans for Hikawa Sando. Meanwhile, the administration formed the Traffic Plan Investigation Council, chaired by Mr. Kubota, Associate Professor of Saitama University, and including members of the Public Safety Commission and road managers. The Council is now in the process of creating short-term, mid-term and long-term measures including TDM in the Hikawa Sando area.

As one of the short-term measures, the City implemented a tentative four-pillar tentative development plan in the 450m-long section of Hikawa Sando. The four pillars are: (1) maintenance of trees, (2) abolition of illegal parking, (3) separation of traffic from pedestrians, and (4) air purification.

2. Analysis and evaluation of the experiment data

2.1 The air purification pavement with light catalyst

There are various ways to get rid of nitrogen oxide emitted by cars. Soil purification and putting a coating on handrails and sidewalk bricks with light catalyst are the methods that have been used in Osaka Prefecture, Chiba Prefecture and in the Saitama New Urban Center in Saitama Prefecture. The results of the surveys done right after the installment of the light-catalyst coating and after one year show that such methods are effective in the removal of nitrogen dioxide from the air (Nonoyama et al., 2001; Okada et al., 2000).

To measure the extent of the air purification effect, the traffic section of Hikawa Sando was coated

with titanium dioxide. This experiment was chosen because the coating is near the place of gas emission, and no maintenance is necessary for the pavement. In addition, the coating work is of relatively low cost (Photo. 1).



Photo 1. Hikawa Sando after an experimental coating.

2.2 Samples of NO_x removal experiment data

This study will analyze two sets of NO_x removal data: one set of the data was collected at the construction site of a complex facility at the Saitama New Urban Center. The data show the initial values and the values then measured after one year. Thus, the effect of the NO_x removal coating can be measured precisely. The second set of the data for analysis was taken at Hikawa Sando after three months of the installment of the light-catalyst pavement. The NO_x removal rate was measured every four weeks.

2.3 Results and analysis of the experiment data

The following three items were analyzed in this study: (1) density of nitrogen oxide in the air, (2) nitric acid ions in the water that washed over the pavement, and (3) a box type nitrogen oxide processing examination. Nitrogen oxide measurements, (1) and (3), were conducted at the East-West Concourse Road at the New Urban Center, and nitric acid ions, (2), were measured at Hikawa Sando.

In principle, the author analyzed the amount of nitric acid amalgam formed from the nitrogen oxide in the auto exhaust. The amalgam was created through oxidization by the light catalyst, and caused to stick onto the surface of the pavement. By measuring the nitric acid ions and the nitrous acid ions in the water that washed the pavement surface as well as in rain water, we can learn how much nitrogen oxide has been removed from the air.

Four examination bodies were fixed on Hikawa Sando (Each body measures W30 cm x L30 cm x D3 cm. Two bodies contain light catalyst, and the other two are blank). The densities of nitric acid ions and nitrous acid ions in the water that washed over the pavement and in the rain water were measured.

1. **Hikawa Sando Data:** A removal rate of nitrogen oxide by light catalyst is 10.77-16.17 mg/m²/day by the nitrogen dioxide conversion value. The mean was 14.35 mg/m²/day. These figures were obtained by deducting the amount measured in the blank examination body.

2. **East-West Concourse Road Data:** It is 2.44-12.15 mg/m²/day. As for the mean, 6.54 mg/m²/day.

The nitrogen oxide density in the air at the East-West Concourse Road was low compared with that of Hikawa Sando. It is thought that traffic volume and the weather condition affected the result.

The volume of NOx removed by light catalyst is shown below:

1. **East-West Concourse Road:** 136 cars/day, after converting the volume of exhaust by an estimated number of cars.
2. **Hikawa Sando:** 690 cars/day

About 500-700 cars pass the East-West Concourse Road, while 4000-5000 vehicles use Hikawa Sando. Analyzing these numbers, it is learned that 14-17% of the total volume of nitrogen dioxide was removed (Table 1 and Figure 1).

Table 1. The air purification measurement result.

	Type of Cars	Gas volume removed by light catalyst (mg/m ² /day)	Number of cars equivalent to the volume of removed gas (cars/day)
East-West Concourse Road	Passenger car	6.54	136
Hikawa Sando	Passenger car	14.35	690

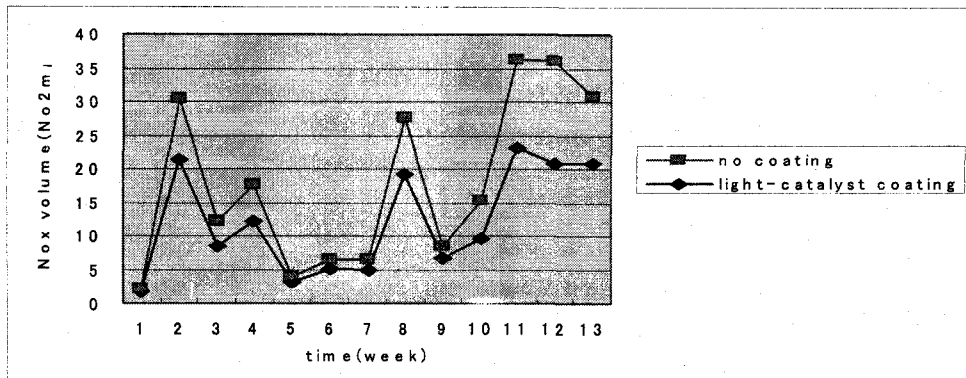


Figure 1. Comparison of removed NOx volume.

The author compared the results of this experiment with the numerical values taken in Osaka (Osaka Prefecture, 1997). The Osaka survey, conducted on busy streets with much traffic and in the center of the city, shows results 10 times as high as the findings of this study, with the NOx volume removed coming to 30-50 mg/m²/day. It is necessary to compare the density of nitrogen oxide in the air at the spot of measurement.

3. Grasp of citizen's awareness

3.1 The method and contents of the questionnaire

To grasp citizen's awareness of the effects of the road development project involving environmental concerns, a questionnaire was handed to the residents who live around Hikawa Sando, and mailed to the residents outside the city. The numbers of the samples were 50 replies (34 valid replies) from the former category of residents, and 100 replies (77 valid replies) from the latter category of residents.

Questions concerning respondent's social attributes, their opinions of the road development plan and its cost were given in the questionnaire in order to assess their awareness of the project's cost effectiveness. The CVM was used to analyze the answers of the questionnaire.

Table 3. Issues included in the questionnaire.

1.Attributes of the respondent: sex, age, place of residence, the number of people in the household, and annual income
2.Level of understanding of the road development project involving environmental concerns
3.Necessity and the cost of permeable pavement
4.Necessity and the cost of the air-purifying pavement

3.2 An analysis of the questionnaire result

The analysis tried to ascertain the priorities which the residents placed on the measures implemented by the road development project involving environmental concerns. (Figure 2) The residents outside the city put priority on separation of traffic from pedestrians, conservation of trees and removal of auto exhaust in that order. It was learned that the most highly regarded measures by the residents emphasize visually recognizable issues such as safe pedestrian space and conservation of nature. At the same time, about 60% of the residents along Hikawa Sando also listed separation of traffic from pedestrians as their top priority. They were most concerned about securing a safe living environment.

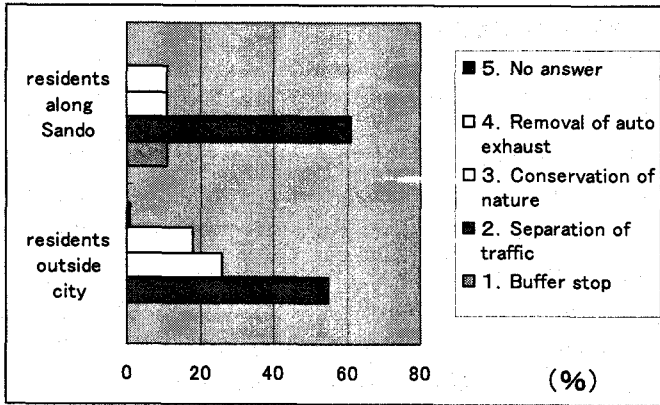


Figure 2. Comparison of road development measures.

The necessity of NOx removal pavement was highly regarded by both the residents along Hikawa Sando, and the residents outside the city (Figure3). However, about 90 % of the residents outside the city think such pavement is necessary, but they did not mention anything about this specific pavement project discussed here. This is probably because they cannot fully appreciate this project’s potential.

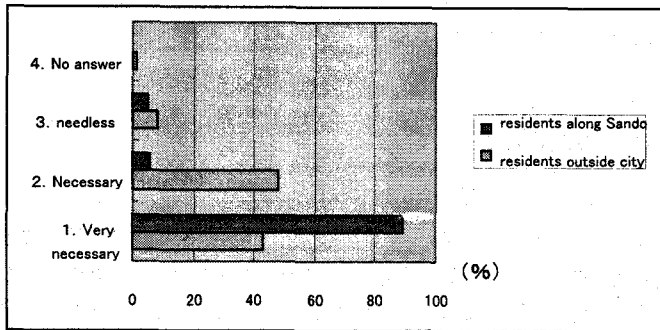


Figure 3. Necessity of NOx removal pavement.

To investigate how willing citizens are to pay the costs of such public works, the author presented the additional cost of a water permeable pavement and that of a NOx removal pavement, and asked the residents whether they think the additional expenditure added on to an ordinary pavement construction project is appropriate or not. The results show that about 50% of the residents outside the city consider the extra expenditures too expensive. This figure is 10 to 20% higher than that of the residents around Hikawa Sando (Figures 4 and 5).

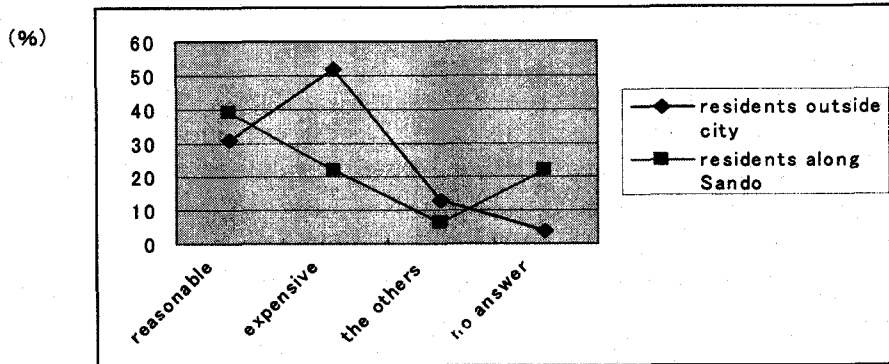


Figure 4. Cost consciousness of a water permeable pavement.

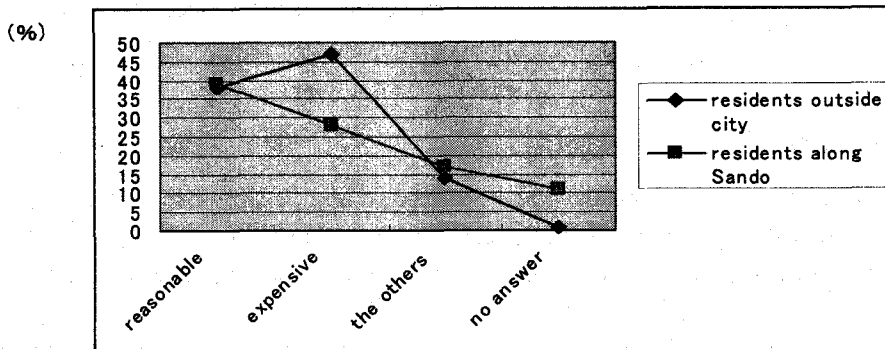


Figure 5. Cost consciousness of NOx removal pavement.

The volume of the removed NOx was 14-17% of the total volume of the auto exhaust according to a measurement after the installment of the NOx removal pavement. Seventeen percent (17%) of the residents along Hikawa Sando and 16% of the residents outside the city think that the effect of the NOx removal pavement is appropriate.

On another note, 80% of the residents along Hikawa Sando who don't think the percentage of the removal rate is not high enough wish the rate to increase to than 50%. This proves that the residents along Hikawa Sando have higher expectancies toward improving their living environment as compared to those who live outside the city (Figure 6).

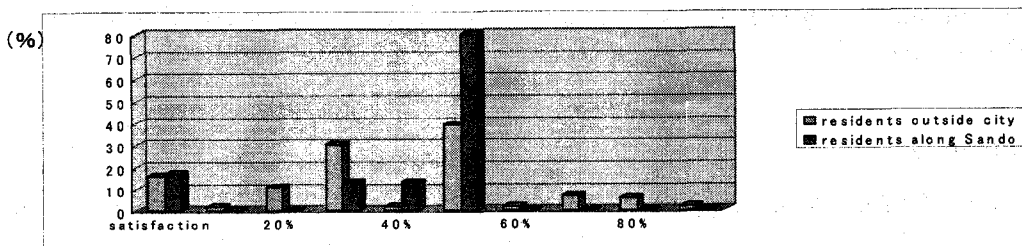


Figure 6. Expectation of NOx removal pavement.

Furthermore, to compare the WTP (willingness to pay) of the water permeable pavement and that of the pavement with light catalyst, the author presented the construction cost per each square meter, and asked the residents whether they think the cost is appropriate or not. The mean of the WTP is shown in Table 4. In both cases, the residents along Hikawa Sandō are more willing to pay higher costs. Showing a higher approval rate than the residents outside the city, the residents along Hikawa Sandō are more appreciative of the measures that improve their environment.

Table 4. The mean of the willingness to pay (WTP).

	m ² unit	Mean of WTP
Permeable pavement	5,600 yen	Residents along Hikawa Sandō 3,725 yen
		Residents outside the city 2,285 yen
Light catalyst pavement	5,000 yen	Residents along Hikawa Sandō 3,000 yen
		Residents outside the city 2,210 yen

4. Conclusions

This study measured the NO_x removal data by light catalyst as a post-project evaluation of the road development project involving environmental concerns. Then a questionnaire was distributed to find out how residents would assess the data. The answers of the questionnaire were analyzed by the CVM.

Furthermore, the author gave out the same questionnaire to the residents that live in the experiment area and the residents outside the city to compare the evaluation by the residents of the two testing groups. The outcomes of the comparison are as follows:

- (1) As for the air purification effect by light catalyst, about 14-17% of the total amount of auto exhaust was removed when the data was converted by the number of vehicles.
- (2) As for the road development project involving environmental concerns, residents have a high expectancy of securing safe pedestrian space.
- (3) In regard to the air purification pavement by light catalyst, residents think it is necessary, and expect that the NO_x removal rate should be improved to over 50%.

This study analyzed the awareness of citizens concerning the cost effectiveness of a public project that is closely related to their environment. The analysis showed that the residents that are directly involved in the public project expect better result than the residents who are asked the same questions as a general theory.

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