Active discussion of alternatives using a simple MCA method leads to improved public involvement

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Abstract: The current study aims to clarify a linkage between the discussion of alternatives and public involvement and to propose measures for improving public involvement. Public involvement is an important process of environmental impact assessment, but the shortcomings are revealed. The study examined public consultation by applying quantitative text analysis to the minutes of meetings from three projects. The study showed a positive correlation between the discussion of alternatives and a sense of public involvement. In other words, those stakeholders who participated in discussions about alternatives, tended to show a high sense of the public involvement. The discussion of alternatives was more active in those projects where a simple method of multiple criteria analysis (MCA) was used rather than a more complicated method. The simple MCA method is likely to activate the discussion of alternatives and as a result, will lead to improved public involvement.

Key Words: Discussion of alternatives, Public involvement, Quantitative text analysis, Multiple criteria analysis

Introduction

The study aims to clarify a linkage between discussion of alternatives and public involvement, and to propose measures for improving public involvement. Although public involvement is a key environmental impact assessment (EIA) process, previous studies have revealed the shortcomings of public involvement in developing countries such as no involvement due to a lack of recognition of early participation (Doelle and Sinclair 2006); the gap between legal process and poor practice (Panigrahi and Amirapu 2012); a lack of understanding of the process (Wiklund 2011); and inadequate notice, the inaccessibility of documents, and a lack of feedback and communication (Walker et al. 2014).

Some studies propose recommendations for improving the low levels of public involvement such as providing access in the communities, adequate notice, and sharing findings in culturally appropriate ways (Spaling et al. 2011); fostering credibility and mutual trust among stakeholders (Kengne et al. 2013); and ensuring the authorities make a credible commitment to public participation (Chi et al. 2014). Other studies focus on a relationship between alternatives and public involvement. Public involvement functions better when public influence is greater during the alternatives analysis phase (Hoover and Stern 2014). One benefit of public involvement is a new insight into possible alternatives (Rega and Baldizzone 2015).

The discussion of alternatives and public involvement may be mutually related, so there is a possibility for improving public involvement through the discussion of alternatives. However, little is known about a linkage between the two processes based on data analysis. One reason for this is the difficulty of analyzing textual

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information contained in the minutes of meetings included in EIA reports. The minutes contain very useful and valuable raw data that helps to aid understanding of the actual discussions around alternatives and public involvement. This study applied quantitative text analysis (QTA) to the minutes of meetings of three projects that were supported by the Japan International Cooperation Agency, which is the executing agency of Japan's official development assistance.

1. Data and methods

1.1 Outline of three projects

The three projects considered in this study are: The Airport Improvement Project (AIP) in Guatemala; The CALA National Road Project (CNRP) in the Philippines; and The Second Mekong Bridge Project (SMBP) in Cambodia (Table 1). There are two reasons for choosing these three projects. First, the minutes of meetings are available with fully transcribed statements by the speakers in accordance with the order of speech. Second, they are currently regarded as good cases for public involvement. Many meetings were held at all three stages of the project (the scoping stage, the intermediate stage between scoping and draft reporting, and the draft reporting stage) and at places and times that allowed stakeholders to participate. As can be seen in Table 1, the number of meetings and participants were 8 and 1231 (AIP), 16 and 996 (CNRP), and 16 and 1595 (SMBP). Between 4 and 19 alternatives were analyzed against 6 to 13 criteria with either a multiple criteria analysis (MCA) of summation method or the analytical hierarchy process (AHP) being employed. By comparing three good cases it is expected that the factors for improving public involvement will be found.

Table 1 Public involvement and alternatives of three projects

(1) Airport Improvement Project (AIP) in Guatemala
8 meetings, 24 stakeholders and 1231 participants, 19 sites and 6 criteria, summation method without weighting
(2) CALA National Road Project (CNRP) in the Philippines
16 meetings, 13 stakeholders and 996 participants, 4 networks and 8 criteria, summation method without weighting
(3) Second Mekong Bridge Project (SMBP) in Cambodia
15 meetings, 18 stakeholders and 1595 participants, 4 methods and 13 criteria, analytical hierarcy process

1.2 Quantitative text analysis (QTA)

The minutes of meetings were analyzed using QTA via KH Coder, a free analytical software (Higuchi 2014). QTA provides a quantitative overview of text data. One benefit is that it allows analysts to search the data using coding rules. Another benefit is that it is possible to compare one set of text data with others by comparing the appearance ratio, which is calculated by dividing the number of paragraphs in which specific coding rule words appear by the total number of all paragraphs.

The coding rules were prepared to focus on five subjects (environmental issues, social issues, development issues, alternatives, and a sense of public involvement), that were the main topics discussed in relation to the consideration of alternatives. The coding rules were prepared by collecting all related words from the minutes. According to the coding rules, (1) environmental issues were suggested by the words *air, ecosystem, fauna, flora, health, noise, odor, pollution, sedimentation, smell, vibration, waste, or water*; (2) social issues were suggested by the words *accident, acquire, acquisition, AIDS, compensate, compensation, concession, employee, employment, house, income, job, labor, land, landownership, livelihood, living, loss, ownership, poverty, property, relocation, resettle, resettlement, safety, settlement, settler, squatter, unemployment, or worker*; (3) development issues were represented by the terms *access, cargo, congestion, decentralization, developer, development, economic, economy, factory, industrialization, industry, invest, investment, investor, jam, market, tourism, tourist, traffic, transport, transportation, or traveler*; (4) alternatives were suggested by the words *alternative, criterion, option, scenario, or site*; and (5) a sense of public involvement was represented by the terms *consensus, consultation, coordination, involve, involvement, participate, participation, stakeholder, or transparency.* Global environmental issues like climate change were not discussed. Articles, pronouns, figures, punctuation marks, and so on were excluded from the analysis as they were unnecessary words.

The number of paragraphs corresponding to each coding rule was counted according to each stakeholder; the appearance ratio was then calculated. The chi-square test was used to test the difference in frequency between stakeholders and the three projects. A difference of $*p < .05$ and $**p < .01$ was considered significant. The stakeholders were then divided into two groups (project proponents and participating stakeholders) and the number of paragraphs was compared between two groups by five subjects and three projects in a mosaic figure. The project proponents were relevant government agencies in charge of projects, consultants, and facilitators. The participating stakeholders were the remaining stakeholders excluding the project proponents.

2. Results

2.1 Number of paragraphs and appearance ratio

A total number of paragraphs and the appearance ratio were calculated by each stakeholder according to five coding rules (Table 2). The number of paragraphs for each project is: 515 (AIP), 509 (CNRP), and 287 (SMBP), with a total number of paragraphs of 1,311. The chi-square values of environmental, social, and development issues, alternatives, and the sense of public involvement between the three projects are: 21.6**, 12.0**, 11.8**, 8.9*, and 37.1** respectively. It could be said that the appearance ratio of the five subjects was significantly different between the three projects, which might reflect differences in the project characteristics, location environment, and stakeholder interests.

During the discussions, it was the project proponents who spoke the most but local people actively took part as well. The number of paragraphs and the appearance ratio of the five subjects for the three projects are: 95 and 7% of environmental issues; 506 and 39% of social issues; 444 and 34% of development issues; 222 and 17% of alternatives; and 193 and 15% showing a sense of public involvement. Some paragraphs discussed two topics or more, while others discussed topics other than the five given subjects. Accordingly, the sum of all five totals does not match with the total number of paragraphs.

2.2 Five subjects and speakers for the three projects

The number of paragraphs in five subjects (environmental issues: EI, social issues: SI, development issues: DI, alternatives: Alt, and the sense of public involvement: PI) by project proponents (P) and participating stakeholders (S) is indicated for each of the three projects (Figure 1). The area of black and white squares represents the number of paragraphs. Social and development issues were the main issues to be discussed and the participating stakeholders joined in the discussion. Both the project proponents and the participating stakeholders were the least interested in environmental issues.

Project proponents explained alternatives and the meaning and process of public involvement; however, the discussion of alternatives and the sense of public involvement by participating stakeholders was low. In particular, the paragraphs and the appearance ratio of alternatives by participating stakeholders in the SMBP were only 6 and 15% (6÷41) although they discussed environmental, social, and development issues more than project proponents did. The number of paragraphs and ratios of alternatives by participating stakeholders in AIP and CNRP were 41 and 38%, and 20 and 27%, respectively. Conversely, the participating stakeholders who discussed alternatives had a tendency to show a high sense of public involvement. For the three projects, the number of participating stakeholders who discussed alternatives was 24 and the number of paragraphs discussed was 67. Out of the above-mentioned numbers, the number of stakeholders and paragraphs that discussed public involvement was 13 and 33. The value for the Spearman's correlation coefficient by rank test between paragraphs of alternatives and the sense of public involvement was 0.77 ($**p<.01$, $n=24$). In addition, ten out of eleven stakeholders who discussed alternatives in more than two paragraphs also talked about public involvement.

Table 2. Number of paragraphs and the appearance ratio of stakeholders and projects

Subjects	Environmental issues		Social issues		Development issues		Alternatives		Public involvement sense		Paragraph
Airport Improvement Project in Guatemala (AIP)											
NIAPO	25	12%	81	38%	83	39%	55	26%	21	10%	213
Local people	2	3%	20	31%	13	20%	12	18%	2	3%	65
CODECO	7	6%	10	18%	10	18%	3	5%	1	2%	55
Facilitator	0	0%	4	17%	4	17%	1	4%	4	17%	23
Business	2	9%	6	27%	6	27%	5	23%	1	5%	22
Consultant	4	21%	9	47%	5	26%	10	53%	1	5%	19
Landowner	0	0%	17	94%	4	22%	6	33%	2	11%	18
Aviation	7	47%	2	13%	5	33%	4	27%	2	13%	15
MCIH	3	25%	2	17%	1	8%	1	8%	0	0%	12
Farm/Agriculture	0	0%	4	33%	1	8%	2	17%	1	8%	12
Central government	0	0%	8	73%	0	0%	0	0%	2	18%	11
Local government	3	27%	5	45%	1	9%	1	9%	1	9%	11
NGOs	1	13%	3	38%	1	13%	0	0%	0	0%	8
Construction	0	0%	1	17%	2	33%	1	17%	0	0%	6
DGCA	0	0%	3	60%	1	20%	0	0%	1	20%	5
Developer	2	50%	2	50%	3	75%	0	0%	0	0%	4
Media	1	25%	1	25%	1	25%	1	25%	0	0%	4
Labor union	0	0%	3	100%	1	33%	1	33%	1	33%	3
Transportation	0	0%	1	50%	2	100%	1	50%	0	0%	2
Industry	0	0%	1	50%	1	50%	1	50%	0	0%	2
NISVMH	0	0%	0	0%	0	0%	1	50%	0	0%	2
College	0	0%	1	100%	1	100%	1	100%	0	0%	1
Religion	0	0%	1	100%	0	0%	0	0%	0	0%	1
Lawyer	0	0%	0	0%	0	0%	0	0%	0	0%	1
Total	57	11%	185	36%	146	28%	107	21%	40	8%	515
Chi-square		436.8		468.6		445.3		461.3		421.9	
CALA National Road Project in the Philippines (CNRP)											
DPWH	9	4%	93	36%	92	36%	43	17%	70	27%	256
Local government	4	5%	21	26%	46	57%	10	12%	11	14%	81
Consultant	2	6%	15	35%	27	63%	11	26%	9	21%	43
Local people	0	0%	19	56%	2	6%	3	9%	0	0%	34
Baranguay	1	3%	11	34%	2	6%	1	3%	1	3%	32
Councillor	0	0%	6	29%	7	33%	0	0%	7	33%	21
Business	1	5%	8	40%	8	40%	5	25%	4	20%	20
Homeowner	0	0%	8	57%	0	0%	1	7%	0	0%	14
Property owner	0	0%	2	67%	2	67%	0	0%	1	33%	3
NGOs	1	50%	2	100%	0	0%	0	0%	2	100%	2
JBIC	0	0%	0	0%	1	100%	0	0%	1	100%	1
HUDCC	0	0%	0	0%	0	0%	0	0%	1	100%	1
Facilitator	0	0%	0	0%	0	0%	0	0%	1	100%	1
Total	18	4%	185	36%	187	37%	74	15%	108	21%	509
Chi-square		361.0		415.0		381.8		402.0		354.0	
Second Mekong Bridge Project in Cambodia (SMBP)											
MPWT	2	3%	34	47%	28	39%	13	18%	19	26%	72
Local people	7	11%	49	74%	24	36%	1	2%	0	0%	66
Consultant	2	4%	12	24%	17	33%	21	41%	15	29%	51
Commune	0	0%	11	65%	8	47%	0	0%	0	0%	17
NGOs	2	14%	9	64%	4	29%	2	14%	5	36%	14
District	0	0%	3	25%	5	42%	2	17%	1	8%	12
MRC	2	18%	2	18%	7	64%	0	0%	2	18%	11
Business	2	20%	6	60%	5	50%	0	0%	0	0%	10
Facilitator	1	14%	2	29%	1	14%	1	14%	0	0%	7
Ferry	0	0%	5	100%	0	0%	0	0%	0	0%	5
University	0	0%	1	20%	2	40%	0	0%	0	0%	5
City Hall	0	0%	0	0%	2	40%	0	0%	0	0%	5
MoEF	1	20%	1	20%	4	80%	0	0%	3	60%	5
MoE	1	50%	0	0%	2	100%	1	50%	0	0%	2
Port	0	0%	1	50%	0	0%	0	0%	0	0%	2
MAC	0	0%	0	0%	1	100%	0	0%	0	0%	1
MoA	0	0%	0	0%	1	100%	0	0%	0	0%	1
MoPT	0	0%	0	0%	0	0%	0	0%	0	0%	1
Total	20	7%	136	47%	111	39%	41	14%	45	16%	287
Chi-square		172.1		189.8*		181.7		182.9		209.6**	
AIP	57	11%	185	36%	146	28%	107	21%	40	8%	515
CNRP	18	6%	185	36%	187	37%	74	15%	108	21%	509
SMBP	20	7%	136	47%	111	39%	41	14%	45	16%	287
Total	95	7%	506	39%	444	34%	222	17%	193	15%	1,311
Chi-square		21.6**		12.0**		11.8**		8.9*		37.1**	

Note: NIAPO: New International Airport Project Office, CODECO: Community Development Councils, MCIH: Ministry of Communication, Infrastructure and Housing, DGCA: Directorate General for Civil Aviation, NISVMH: National Institute of Sismology, Volcanology, Meteorology and Hydrology, DPWH: Department of Public Works and Highways, JBIC: Japan Bank for International Cooperation, HUDCC: Housing and Urban Development Coordinating Council, MPWT: Ministry of Public Works and Transportation, MRC: Mekong River Commission, MoEF: Ministry of Economic and Finance, MoE: Ministry of Environment, MAC: Mine Action Committee, MoA: Ministry of Agriculture, MoPT: Ministry of Post and Telecommunication

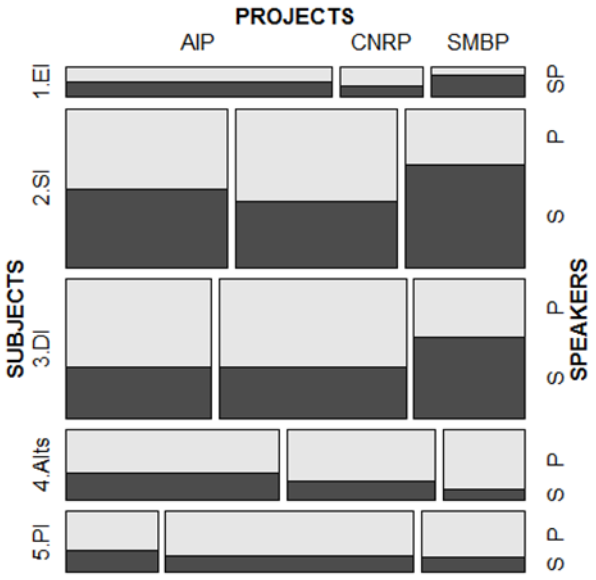

Figure 1 Five subjects and speakers in three projects

3. Discussion

3.1 Discussion of alternatives and analysis methods

The number of participating stakeholders who discussed the alternatives, the number of paragraphs, and the ratio of these to the total number of paragraphs that discussed alternatives were: 15, 41 and 38% (AIP); 5, 20 and 27% (CNRP); and 4, 6 and 15% (SMBP). The amount of discussion of alternatives during the SMBP was very low and the AHP method of analysis was used. When AHP was used, the public was less likely to comment on the alternatives. When the summation method was used, the public was more likely to comment.

AHP is a method that uses a pair-wise comparison; this method holds that more complex algorithms and procedures of AHP may present a "black box" analysis to stakeholders. A simple and understandable method is most appropriate (Hajkowicz, 2008). In the case of the SMBP, it is probable that participating stakeholders did not understand the algorithm and calculation of AHP scores very well. In order to understand a pair-wise comparison, some knowledge of statistics is needed. Participating stakeholders talked about environmental, social, and development issues more than the project proponents but the discussion of alternatives was very inactive. On the other hand, the summation method was used in the AIP and the CNRP and the discussion of alternatives was active. The summation method was very simple for stakeholders to understand. The AIP had more alternatives than the CNRP and the discussion was more active. A summation method with a wide range of alternatives may be the best out of the three case studies.

3.2 Discussion of alternatives and public involvement

Out of the total number of participating stakeholders who discussed alternatives, 8 stakeholders mentioned public involvement in 11 paragraphs (AIP); 3 mentioned it in 16 paragraphs (CNRP); and 2 mentioned it in 6 paragraphs (SMBP). The correlation coefficient between paragraphs of alternatives and the sense of public involvement is 0.77 (**p<.01, n=24). The number of participating stakeholders who discussed alternatives in more than two paragraphs was eleven for three projects; ten out of eleven stakeholders spoke about public involvement. The participating stakeholders who discussed alternatives, tended to show a high sense of public involvement.

The discussion of alternatives affects the attitude of participating stakeholders in consultation (Cuppen et al., 2012). The development of alternatives contributes to the higher perceptions of public influence but sophisticated technical knowledge lowers levels of public influence (Hoover and Stern, 2014). The linkage between alternatives analysis and public involvement is recognized in the causal model of the overall quality of the EIA reports. A good alternatives analysis may bring about improved public involvement (Kamijo and Huang, 2016). It is probable that the discussion of alternatives and a sense of public involvement are positively correlated. Complicated alternatives analysis methods may reduce both the willingness of participating stakeholders to discuss alternatives and the sense of public involvement. Simple and

easy to understand alternatives analysis methods with a wider range of alternatives that reflect the interests of diverse stakeholders may activate the discussion of alternatives and improve public involvement.

Conclusions

The purpose of this study is to clarify the linkage between the discussion of alternatives and public involvement and to propose measures for improving public involvement. In comparison to AHP, a simple MCA method using summation activated a discussion of alternatives. The stakeholders who discussed alternatives tended to show a high sense of public involvement. The positive correlation between the discussion of alternatives and a sense of public involvement was identified based on the three project case studies. The simple MCA method may activate a discussion of alternatives and lead to an improvement in public involvement. Alternatives analysis methods must be simple and understandable for participating stakeholders as it is difficult for them to understand the algorithm and calculation of complicated methods. A simple MCA method has the potential to activate a discussion of alternatives and may lead to an improvement in public involvement. The results of QTA applied to the minutes of meetings are new and would be beneficial for understanding public involvement and alternatives analysis.

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