

How to improve EIA system in developing countries? A quantitative literature review

Tetsuya KAMIJO*

Abstract: EIA was introduced in many developing countries from the early 1980s. They have implemented EIA over the past 30 years but the weak enforcement has been a major problem. This study built a sample of 82 documents between 1985 and 2016 about EIA system in developing countries, and examined constraints of EIA system and recommendations using quantitative text analysis (QTA). The constraints and recommendations changed before and after 2000 and in particular, a ratio of constraint on report quality nearly doubled after 2000. The study proposes to focus on improving the quality of an environmental impact statement (EIS) in order to improve the EIA system in developing countries, because EIS is a product of an EIA process and is a fundamental indicator of an effective EIA system. Further research is needed to review the quality of EIS in developing countries in order to find determination factors for improving their quality.

Key Words: Environmental impact assessment, Developing countries, Constraints, Quantitative text analysis, Environmental impact statement

Introduction

EIA was introduced in many developing countries from the early 1980s. Many studies evaluated EIA in developing countries over the past 30 years. Despite the early introduction of mandatory EIA system in Southeast Asia, the practice was still limited in the 1990s (Briffett 1999). The World Bank revealed that project design did not yet sufficiently reflect EIA (Scholten & Post 1999). After 10 years, weak enforcement was yet a major problem in many developing countries in East and Southeast Asia. The weak enforcement was reflected through late implementation, insufficient consideration of alternatives, weak consultation, and a lack of information disclosure (World Bank 2006, p. 15). Previous studies about evaluation of EIA in developing countries proposed recommendations to improve EIA system such as capacity building and public involvement (Marara et al. 2011; Panigrahi and Amirapu 2012; Al-Azri

et al. 2014). However, little is known about the solution mechanism for constraints at the present. There is a possibility to find a solution by comparing time series text data of constraints and recommendations using quantitative text analysis (QTA). QTA analyzes textual information of documents quantitatively, and applied to environmental studies such as the analysis of discussions and newspapers. This study applied QTA to documents of EIA system in developing countries over the past 30 years for the purpose of proposing a way to improve the EIA system.

1. Data and methods

1.1 Documents of EIA system in developing countries

This study focused on peer-reviewed articles published in international journals, books, and conference papers in the field of EIA system in

* JICA Research Institute, Japan International Cooperation Agency

developing countries. A search query of the EBSCO Environment Complete database was conducted for documents that contained 'environmental impact assessment' or 'EIA' in their title. This initial search returned 1,184 documents. The documents were then manually screened to ensure that each was relevant to the fields of interest. This reduced the total to 31. Because a database search cannot fully assemble all relevant documents, the author added articles and books based on his previous experience in the field, bringing all documents reviewed to 82, and spread across 11 journals, 8 books, and 4 reports of international organizations between 1985 and 2016 (Table 1). Asian countries established EIA legislation at an early stage, so the documents in Asia were available in 1985 to 1990. Asia has most documents in each period (43 documents in total). Next to Asia, 22 are from Africa, 9 from Middle East, 4 from Latin America, and 4 from the whole developing countries. The constraints and recommendation of 82 documents were summarized and this summary was used as raw data.

1.2 Quantitative text analysis

The documents were analyzed using QTA via KH Coder, free analytical software (Higuchi 2014). The QTA provides a quantitative overview of text data. One benefit is to allow analysts to search the data using coding rules. The coding rules were prepared to focus on seven subjects (law and administration, capacity building, public involvement, monitoring, information, report quality, and alternative) were prepared. They were identified as major constraints on EIA system. The KH Coder shows an appearance ratio for each coding rule. The appearance ratio is calculated by dividing the number of documents in which specific coding rule words appear by the total number of all documents. According to the coding rules, (1) law and administration were suggested by the words administrative, agency, authorities, authority, bureaucracy, bureaucratic, commitment, comply, cooperation, coordination, decentralization, enforcement, framework, fund, government,

institution, integrate, integration, law, legal, legislation, license, link, linkage, modification, policy, policies, political, procedure, process, regulation, regulator, rule, system, or treatment; (2) capacity building by capacity, education, empowerment, experience, expert, expertise, guideline, knowledge, manpower, professional, qualification, qualified, research, resource, skill, skilled, trained, or training; (3) public involvement by awareness, communication, consultancy, consultation, debate, involvement, or participation; (4) monitoring by evaluation, follow-up, monitor, or monitoring; (5) information by access, baseline, data, inaccessible, information or map; (6) report quality by report, review or quality; and (7) alternative by alternative. These words were selected from words appearing in the raw data. Articles, pronouns, figures, punctuation marks, and so on were excluded from the analysis.

The constraints and recommendations were compared before and after 2000 using QTA. By 2000 many developing countries introduced EIA systems and since 2000 they have experienced EIA operations. An evolution of EIA systems was therefore expected to clarify by comparing before and after 2000. Six documents were excluded from an analysis of recommendations because relevant descriptions were not present.

2. Results

2.1 Differences between constraints and recommendations before and after 2000

A number represents the number of documents and a percentage represents the appearance ratio. Law and administration, capacity building and public involvement were major constraints and major recommendations before and after 2000 (Table 2). Before 2000 there was no difference between constraints and recommendations about six subjects except alternatives. The difference of alternatives was significant ($*p < .05$). The reason was because it could be difficult to address the alternatives due to weaknesses of related laws and administration before 2000 (Brown et al. 1991; Nor 1991; Ebisemiju 1993; Lohani et al. 1997).

Table 1. Number of documents by period, regions, journals and books between 1985 and 2016

Region, journal and book	1985-1990	1991-2000	2001-2010	2011-2016	Total
Region					
Asia	6	10	19	8	43
Africa	0	6	12	4	22
Middle East	0	1	5	3	9
Latin America	0	3	1	0	4
Whole developing countries	2	1	1	0	4
Total	8	21	38	15	82
Journal and book					
Environ Impact Assess Review	6	12	16	5	39
Impact Assess Project Appraisal	0	2	11	6	19
Books					
International Organizations	1	3	3	1	8
Int Dev Plan Review	1	1	2	0	4
Int Dev Plan Review	0	1	1	0	2
J Environ Assess Policy Manag	0	0	2	0	2
The Environmentalist	0	0	2	0	2
Int Association Impact Assess	0	1	0	0	1
J Environ Manag	0	1	0	0	1
Int J Human and Social Sci	0	0	1	0	1
Environ Monitor Assess	0	0	0	1	1
Environ Natural Resources Research	0	0	0	1	1
J Environ Protect	0	0	0	1	1
Total	8	21	38	15	82

Table 2. QTA results of constraints and recommendations before and after 2000 (Significant at $*p < .05$, $**p < .01$)

Period	Law and administration		Capacity building		Public involvement		Monitoring		Information		Report quality		Alternative		Documents
1985-2000															
Constraints	22	76%	19	66%	19	66%	10	34%	11	38%	7	24%	6	21%	29
Recommendations	21	78%	13	48%	13	48%	5	19%	9	33%	7	26%	0	0%	27
Total	43	77%	32	57%	32	57%	15	27%	20	36%	14	25%	6	11%	56
Chi-square	0.00		1.09		1.09		1.09		0.01		0.00		4.28*		
2001-2016															
Constraints	47	89%	39	74%	38	72%	28	53%	21	40%	24	45%	20	38%	53
Recommendations	39	80%	39	80%	35	71%	17	35%	10	20%	20	41%	4	8%	49
Total	86	84%	78	76%	73	72%	45	44%	31	30%	44	43%	24	24%	102
Chi-square	0.98		0.23		0.00		2.70		3.58		0.07		10.79**		

Table 3. QTA results before and after 2000 of constraints and recommendations (Significant at $*p < .05$, $**p < .01$)

Period	Law and administration		Capacity building		Public involvement		Monitoring		Information		Report quality		Alternative		Documents
Constraints															
1985-2000	22	76%	19	66%	19	66%	10	34%	11	38%	7	24%	6	21%	29
2001-2016	47	89%	39	74%	38	72%	28	53%	21	40%	24	45%	20	38%	53
Total	69	84%	58	71%	57	70%	38	46%	32	39%	31	38%	26	32%	82
Chi-square	1.45		0.26		0.11		1.85		0.00		2.72		1.79		
Recommendations															
1985-2000	21	78%	13	48%	13	48%	5	19%	9	33%	7	26%	0	0%	27
2001-2016	39	80%	39	80%	35	71%	17	35%	10	20%	20	41%	4	8%	49
Total	60	79%	52	68%	48	63%	22	29%	19	25%	27	36%	4	5%	76
Chi-square	0.00		6.58*		3.12		1.50		0.94		1.10		0.98		

After 2000 there was no difference between constraints and recommendations in law and administration, capacity building, public involvement, and report quality. The difference in monitoring information, and alternatives became large. In particular, the difference of alternatives was more significant than before 2000 (** $p < .01$). After 2000, laws and administration about capacity building and public involvement were improved but ones about monitoring, information, and alternatives could have still weaknesses amid growing need for their enforcement (Clausen et al. 2011; Momtaz & Kabir 2013; Heaton & Burns 2014).

2.2 Differences before and after 2000 in constraints and recommendations

The differences before and after 2000 in constraints and recommendations were shown in Table 3. The appearance ratio of constraints on the seven subjects remained constant or increased after 2000. In particular, the ratio of report quality nearly doubled from 24 to 45 percent, which was growing concern after 2000.

The appearance ratios of recommendations of five subjects (capacity building; public involvement; monitoring; report quality; and alternative) increased after 2000. Particularly, the appearance ratios of capacity building and public involvement showed a large increase after 2000. They were expected to solve constraints. In particular, the difference of recommendations in capacity building before and after 2000 was significant (* $p < .05$). The QTA results offer a hint on how to improve EIA system in developing countries.

3. Discussion

3.1 Solutions to constraints of the EIA system

Developing countries have strengthened their EIA legislation and gained the experience of EIA operations over the past 30 years (Briffett et al. 2004; Coşkun & Turker 2011; Suwanteep et al. 2016). The EIA law and administration are developing as a whole but monitoring, information,

and alternatives are still weak. The appearance ratios of seven subjects in constraints did not decrease, and remained constant or even increased after 2000. These seven subjects in constraints have basically not been solved yet despite the lapse of time. Capacity building and public involvement are expected to improve EIA practices in developing countries after 2000. But it is not certain that they solve the constraints, because solution mechanisms are not clear. An effective EIA system can be defined as one that includes three major dimensions: adequate institutional arrangements; the quality of an environmental impact statement (EIS); and implementation of mitigation measures (Sadler 1996; Momtaz & Kabir 2013). The appearance ratio of report quality in constraints nearly doubled after 2000. Developing countries improve their EIS quality after institutional arrangements (laws and administration). Improvement of EIS quality could be one solution to improve EIA system in developing countries.

3.2 Solving constraints of EIA system focusing on improving the quality of EIS

Developing countries faced issues to improve the EIS quality after 2000. EIS could be the fundamental indicator of an effective EIA system for the reason that the information presented in an EIS reflects the technical and scientific quality of the EIA process. The EIS document is the only way to incorporate and present scientific knowledge in an EIA study. EIS is the product of an EIA process (Momtaz & Kabir 2013). There is a clear relationship between the quality of EIS and the effectiveness of the EIA system (Wende 2002). The quality of EIS is useful in indicating the likely effectiveness of its proposed mitigation measures (Gwimbi & Nhamo 2016a). Available evidence suggests that the EIS were of satisfactory quality when mitigation measures were implemented well (Gwimbi & Nhamo 2016b). The quality of EIS could have a positive effect on monitoring too.

EIA practitioners collect environmental and social information, consider alternatives, reflect public involvement, predict impacts, propose

mitigation measures, and prepare EIS according to EIA legislation and guidelines. The EIA authorities review EIS, which are revised when necessary. The quality of EIS is likely to reflect other six subjects.

It can be said that the EIS is the fundamental indicator of an effective EIA system. It is proper to focus on improving the quality of EIS compared to addressing seven constraints individually. However, little is known about methods for improving the quality of EIS. One reason is that the number of EIS quality studies in developing countries is still limited (Sandham & Pretorius 2008; Badr et al. 2011; Momtaz & Kabir 2013; Sandham et al. 2013; Chanty & Grünbühel 2015).

Conclusions

This study showed that the constraints and recommendations of EIA system in developing countries changed before and after 2000, and in particular a ratio of constraint on report quality nearly doubled. This study proposes to focus on improving the quality of EIS in order to solve the constraints of EIA system in developing countries. The previous research identifies constraints to EIA system but little is known about solutions. This study is a first literature review using QTA methodology with respect constraints and recommendations of EIA system in developing countries, and the quantitative overview of constraints and recommendation provides the hint how to improve EIA system. The literature review using QTA advances the knowledge to improve EIA system in developing countries.

The quality of EIS is an indicator of an effective EIA and could reflect other six constraints including capacity building, public involvement, monitoring, information, and alternatives. Determination factors for improving EIS quality and their improving methods could be concrete recommendations to improve not only EIS quality but also EIA system in developing countries. There must be many EIS in developing countries at the present. More EIS quality review research is needed.

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