

ENVIRONMENTAL IMPACT ASSESSMENT RESEARCH IN JAPAN: RETROSPECTIVE AND PROSPECTIVE

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Environmental Impact Assessment (EIA) research have been performed in a wide range of topics over 40 years in Japan. The study underlying this paper reviewed the achievement of Japanese EIA research through the academic database survey and identified which areas would be required for future EIA research. As a result, whilst there are only 30–50 EIAs conducted per year under EIA Act and genuine SEA is currently not practiced, there is a noticeable research interest with over 30 associated research papers published in the professional Japanese literature every year on average. Most of EIA articles could be classified into five groups; (a) systems and laws, (b) methods, (c) Theme-oriented Studies, (d) Sector-oriented Studies and (e) Case Studies. The following three main areas were identified for future EIA research; (1) studies on pro-active sound decision making for sustainability; (2) effectiveness of EIA from a proponent's viewpoint, leading to enhance public acceptance, for example; and (3) substantive and methodological aspects, including the use of both quantitative and qualitative evaluation methods.

Keywords: EIA; EIA research review; Japan; SEA; CiNii database.

Introduction

In Japan, environmental impact assessment (EIA) research has been mainly performed by experts in social engineering, environmental law, ecology or in the use of specific impact-prediction technologies. In particular, technological impact-prediction research has had a long history because this field was of interest prior to the initiation of EIA research to address serious environmental pollutions in the 1950s. Full-scale EIA research commenced after the implementation of the

National Environmental Policy Act (NEPA) in 1970. Although it is now over 40 years since the first EIA study publication, EIA research has been continuously focused on by individual experts from diverse fields until the EIA Act enactment.

After the EIA Act enactment in 1997, the Japan Association for Impact Assessment (JSIA) was established as a platform for the discussion of various EIA issues by EIA-related experts such as academics, administrators, consultants and non-governmental organisations. Consequently, since this time, there has been a significant growth in EIA. This study aims to clarify the achievements of EIA research in Japan through a comprehensive literature review of EIA studies from which future directions are then illuminated.

Overview of Japanese EIA Research

A literature search was performed using the “CiNii database”, which is one of the major scientific databases including over 16 million articles published by academic societies, to gain an initial overview of Japanese EIA research. Articles found under the search string “環境アセスメント (in Japanese)”, which means “Environmental Impact Assessment (EIA)” were 1196. Because the term EIA is sometimes used as a broad concept by different communities, the target EIA studies of this paper were selected in accordance with the criteria as following; (a) including not only the term EIA in its title but also technical terms associated with EIA research such as SEA, scoping, EIA act/ordinance, streamlining, HEP and so forth, (b) published as a special feature article of EIA-related issues, (c) published in the academic journals of *Japan Society for Impact Assessment (JSIA)*; (d) using the term EIA in terms of the formal EIA system. If one condition in the above (a)–(d) is satisfied, the article is considered as EIA-related.

Moreover, after eliminating duplications and non-scientific papers such as book reviews, and conference session reports, 964 articles were finally identified. These were then classified into five groups 1. Systems and Laws, 2. Methods, 3. Specific Themes, 4. Case Studies, 5. Others (Fig. 1). The first article in an academic journal that included the keyword “Environmental Impact Assessment” was published in 1973. Notably, only six papers were published in that year, in which the features of EIA systems and a discussion of the Norwegian EIA system were introduced. Many papers were written in the late 1970s; this was mainly because of the EIA legislation that was then under consideration (e.g., Shimazu, 1976). However, there were fewer papers (0–23) in the 1980s because the EIA Act had failed to pass and was dropped in 1983 owing to strong opposition in economic and industrial circles. On the contrary, once the EIA Act was ultimately enacted in 1997, the

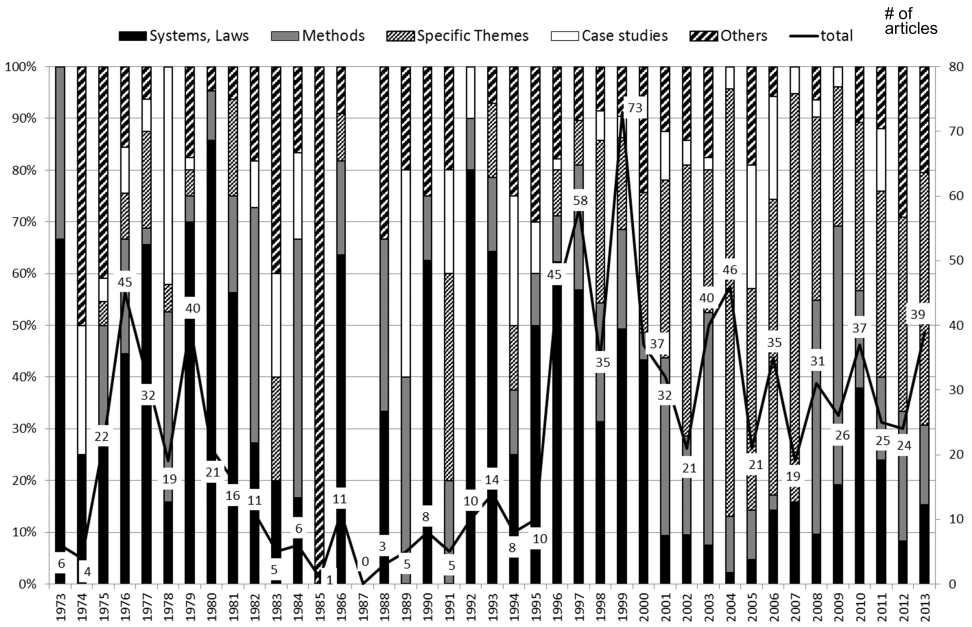


Fig. 1. Year-to-year overview of EIA research in Japan 1973-2013, N = 964.

number of papers produced rose significantly. Therefore, at that time, the majority of EIA studies were focused on systems or legal aspects.

During the enactment of the 1997 legislation, the research tended to focus on the basic principles of EIA. For instance, the importance of the participatory approach and the technological aspects of prediction or evaluation were widely covered (Shimazu, 1996). The scientific and democratic aspects of EIA were also popular topics because they were crucial for successful EIA implementation (Harashina, 1996). Studies that examined the scope of the NEPA procedure (Yanagi, 1997), from which the essential points for EIA legislation and implementation had been collected from more advanced countries were also published.

Intensive discussions on EIA systems and legal implications were also found in a series of JSIA activities, such as in special issues of JSIA academic journals, the themes of symposiums at annual conferences and open seminars (see Table 1). Eight out of 45 EIA-related themes are classified as system or law study, which makes this the most frequent among the five categories. This strong focus on legal and technical issues indicates that policy recommendations and technical improvements were considered of primary importance in EIA study. Accordingly, institutional issues such as the establishment of targets for EIA applications, the incorporation of public involvement opportunities into the EIA procedure to enhance democratic functions and SEA system legislation were widely discussed.

Table 1. Themes of special issues, symposiums and seminars of Japan Society for IA: 2003–2014.

Year	Special Issue Themes	Symposium Themes at Annual Conference (●), Open Seminar Themes (○)
2003	Ecosystem in IA GIS and IA	● Expectation to JSIA (Japan Society of IA), ● Scoping ○ Possibility of Participatory Policy Making
2004	International Cooperation and IA	● Developments in Okinawa Pref. and IA ● IA for Decommissions/Rehabilitations ○ Quantitative Evaluation of Ecosystem in a Water Area
2005	Prediction/Evaluation Method: air etc	● Effectiveness of EIA Act. ● IA of Aichi Expo. 2005 ○ The Cutting Edge of IA Methods
2006	Prediction/Evaluation Method: soil etc Social IA: JICA guideline	● Landscape and IA ○ Lessons from IA in Local Governments
2007	SEA	● 10 Years Retrospective of EIA Act ○ Environmental Information and Communication
2008	Consensus Building and IA Evalu- ation Method of Wetland Eco- system	● Review of EIA Act: Uncertainty ○ IA role in Waste Managements
2009	Convention on Biological Diversity and IA	● Amendment of EIA Act ○ Review Committees in IA
2010	History of IA	● Role of IA for conservation of Biodiversity ○ Follow Up in IA
2011	Small/Consize IA 2011 Earthquake/ Nuclear Disaster and IA	● SEA for Energy Mix. ● EIA Act: Retrospect and Prospect ○ Small IA
2012	Geothermal Development and IA	● Movement of IA Audinances in Local Governments ● Quantitative Evaluation for Biodiversity ○ Communication in IA
2013	Wind Power Developments and IA	● Small/Consize IA, ○ Wind Power Developments and IA
2014	IA for Post-Disaster-Rehabilitation	● SEA, ○ Survey Method of Sea Area Ecosystem in IA

In recent years, themes focusing on specific EIA technologies have been increasing. In particular, there has been a greater focus on ecological issues (104 articles) than on other types of impact studies discussing the technical aspects of EIA (Fig. 2). The number of articles related to the impact of air, noise and water pollution accounted for less than that of ecology. EIA systems and methodologies have been developed beyond serious environmental pollution concerns, and methodologies to predict air, water and noise pollution impacts have risen in

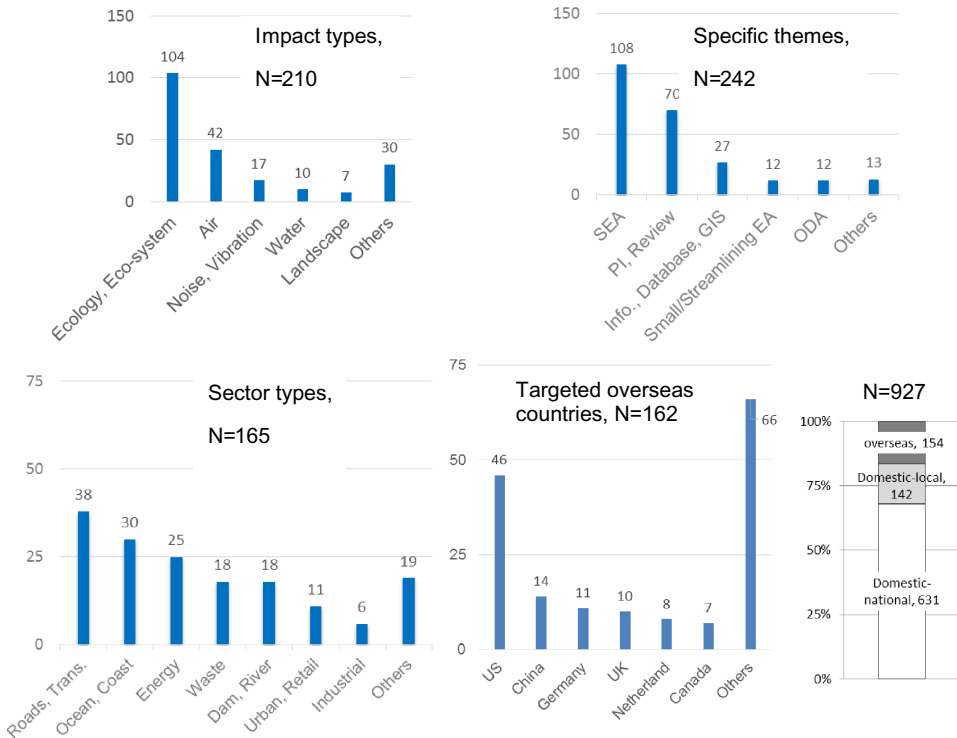


Fig. 2. Frequency of EIA articles in each classification.

sophistication. In reality, research in these areas have not necessarily been performed as specific EIA research and undertaken in specific disciplinary areas. However, even now, because little is known about the specific issues regarding EIA technologies, such as the health impacts due to low frequency noise from wind turbines or the superconductivity caused by the Linear Chuo Shinkansen Line (scheduled to open in 2027), more studies are required.

Studies on ecology appeared as one of the most important themes among the EIA studies because it has often been focused on in special issues of the academic journals published by JSIA (see Table 1); this is because fauna and flora surveys have been considered important in EIA. In particular, although the Japanese EIA system has intentions to evaluate environmental impact using quantitative approaches, the methodology has not yet been well developed, particularly in ecosystem evaluations. In this context, HEP (Tanaka, 2003) and biodiversity or eco-services economic evaluation methods (Hayashi, 2009) have been investigated. In practice, the potentially adverse impact on raptors has led to debates on

project abandonment (found in some wind power projects) or on thorough reviews of proposed actions (Aichi Expo. in 2005). More studies on not only evaluation methods but also mitigation measures in the field need to be performed.

With regards to specific themes, SEA has become one of the most important EIA issues, and public involvement (PI) has also been increased in importance. Many advanced SEA cases in the US or European countries have been of particular focus. For example, papers regarding SEA methodologies applied to spatial planning in the US, UK and Germany have been published (Shibata *et al.*, 2008; Tajima, 2013; Matsuyuki, 2013), in addition to studies on alternative evaluation methods and local government case studies. Moreover, PI and the social impacts due to Japan International Cooperation Agency's ODA activities (Murayama, 2010) appeared as important topics. Regarding concise EIA or streamlining EIA, only around 10 articles were found that clarified the effectiveness of concise assessments. For example, Harashina (2013) discussed the effectiveness of introducing concise EIA systems in Japan, Nishikizawa (2013) analysed the characteristics of EA implementation under NEPA and Shibata *et al.* discussed a case study on concise assessment in Japan. Although there are other important viewpoints related to disaster management, only a few studies have focused on a better integration of EIA and disaster management (Tajima *et al.* 2013) or the streamlining EIA for rapid rehabilitation from a disaster. Because large-scale natural disasters such as earthquakes, floods, landslides or eruptions have become more frequent in recent years worldwide, more research should be performed regarding this context.

When considering EIA in specific sectors, there were many studies related to transportation, ocean/coast and energy. Both transportation and energy research fields emerged in the early 1970s because at that time, the Japanese society was dealing with serious air pollution due to rapid industrialisation and urbanisation, both of which had led to a significant rise in motorisation and energy consumption. In recent years, road construction issues have become a novel research sector that has become especially active in encouraging the incorporation of public involvement into its planning process. Moreover, the promotion of renewable energies has been considered crucial for sustainable societies, particularly after the 2011 Great East Japan Earthquake. Consequently, a large number of studies regarding roads and energy have been performed.

When the feed-in-tariff system was introduced in 2012, a large number of wind farms and other renewable energy facilities were proposed, most of which, apart from solar power facilities, have been constructed under the EIA Act. Although there have been some previous studies focusing on the mechanisms required to enhance public acceptance of the promotion of renewable energies, more studies

need to be performed. For example, some previous studies have sought to clarify the essential factors required to construct consensus between hot spring owners and geothermal developments (Uechi *et al.*, 2013), but little is known about the effective methods thus far because of a lack of specific research in this area after the EIA Act implementation.

More research on wind power developments need to be performed, as few studies focusing on the social impacts (Nishikizawa, 2013) or the factors or mechanisms required for conflict resolution have been performed (Baba, 2004; Azechi *et al.*, 2014). Moreover, although there is a pilot project for an offshore wind turbine currently being performed by the Ministry of the Environment, the impact on the ocean ecosystem is unknown because of the shortage of empirical studies.

Another important issue in EIA research is dealing with nuclear disasters, including the treatment of radioactive substances. In reality, the EIA Act (and other associated laws) was amended to protect the environment from radiation poisoning in 2013, but comprehensive research on such issues as forecasting, evaluation and the setting of reasonable baselines have been sparse.

Today, as highly advanced technological developments such as carbon captured and storage or geo-engineering, both of which might have devastating and irreversible impacts, are being considered for mitigation or adaptation measures to minimize the negative impacts of climate change, EIA research regarding these areas are predicted to grow over the next few years.

Challenges for EIA Research

On the basis of the above literature review, there are three main areas that require future EIA research. First, more EIA studies are required to focus on sound decision making for sustainability. To date, research has tended to concentrate on environmental conservation or mitigation issues after incidents of serious environmental pollution, rather than on the development of preventative decision support instruments. Therefore, proponents have tended to recognise EIA as a “nuisance” that wastes both time and money. In addition to exploring practical methods of streamlining EIA, the benefits need to be clarified in future EIA research.

Second, to clarify the effectiveness of EIA from a proponent’s viewpoint, EIA research should explore practical methods to enhance the public acceptance of EIA proposals. For example, empirical studies to collect data on geothermal development impacts on hot springs or the wind power development impacts on the raptor ecology need to be performed. Moreover, new types of participatory approaches to

activate communication such as deliberative polling or consensus conferences could be considered effective methods for constructing social consensus through the EIA process.

Finally, for the technical aspects required to enhance public acceptance, EIA research should pay more attention to the substantive roles required to support wise and inclusive decision making. In particular, comprehensive evaluation methodologies need to be investigated, such as the formulation of alternatives that embrace economic and social factors and the use of both quantitative and qualitative evaluation methods.

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