EIA as a Conflict Mitigation Tool for Wind Farm Projects in Japan

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Abstract

Wind energy should be one of the important options of Japanese renewable energy policy as in other countries. This study aims to demonstrate both effectiveness and ineffectiveness of EIA in terms of a conflict mitigation of wind farm projects in Japan. The result of eight cases shows that the projects with high level of public participation at EIA stage are more likely to be successful, however beyond a certain project difficulty determined by the site characteristics, this is not necessarily the case. And the result also demonstrates two concrete challenges should be addressed in Japan: (1) enhancement of poor public participation and (2) strategic exclusion of sensitive site characteristics by introducing the strategic measure. To be more specific, the following two were identified as the sensitive characteristics: “land-use regulation by Natural Parks Act” and “the disclosed grid habitat for Golden Eagle.”

1. Introduction

In Japan, the momentum to shift to renewable energy was enhanced by the Fukushima Dai-ichi Nuclear Accident on March 11, 2011. As in other countries, wind energy should be one of the important renewable energy options in Japan, because of its cost-effectiveness and high potential. However, environmental conflicts arose from concerns of locals and environmental groups pose a significant barrier to wind farm development. In response, there has been increasing discussion about measures to address the concerns and ease the conflicts.

EIA could be a tool for conflict mitigation by providing the public with project information and exchanging opinions with the stakeholders to address the concerns. However, in Japan, EIA was not legally required for wind farm projects under the EIA Act until the recent amendment on 2011. Therefore, most of the EIAs have followed the guideline by NEDO (the organization which promotes renewable energy) and only several cases had followed the ordinance of local governments.

Toward the enforcement of the amended EIA Act, and anticipation of an introduction of strategic measures (i.e. SEA and land use zoning for wind farm), now it is necessary to demonstrate how and to what extent EIA could help conflict mitigation under the Japanese context. Therefore, this study aims to demonstrate both the effectiveness and ineffectiveness of EIA as a conflict mitigation tool and show its conditions.

2. Analysis Framework

2.1. Focused variables and hypothesis model

Fig. 1 shows three focused variables and a hypothesis on a mechanism how they impact project outcome.

The first variable is “Participation”. Participation is defined as the level of public participation at EIA stage and it consists of four successive elements: (1) Notification (2) Informing (3) Dialog (4) Modification (the each definition is shown in Table 1).

Secondly, we defined “degree of project difficulty” as a variable which constrain the effectiveness of EIA. Project difficulty is defined by a level of the site specific difficulty determined by the site characteristics.

Thirdly, “Outcome” is defined as the level of project success determined by whether conflicts arose or not and whether the conflict mitigation was successful or not.

Using these variables, we show following conditional equation as a general effectiveness of public participation.

Table 1: Definition of the four elements of participation

<table>
<thead>
<tr>
<th>Element</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notification</td>
<td>to notify the stakeholders of information about project outline and planning procedures</td>
</tr>
<tr>
<td>Informing</td>
<td>to provide the stakeholders with information about project detail and EIS</td>
</tr>
<tr>
<td>Dialog</td>
<td>to provide the stakeholders with opportunities to exchange opinions</td>
</tr>
<tr>
<td>Modification</td>
<td>to confirm the concerns of the stakeholders and reflect in the plan modification</td>
</tr>
</tbody>
</table>
Secondly, we plotted all the cases to the same plane as in
2.2. Method of demonstration by the hypothesis model
demonstrated by confirming whether a result of
area (b) is subject to the level of
the model (Fig. 2). For this, firstly we calculated
Project difficulty
remaining area (a) whose
distribution of multi case studies could be explained by
relationship is expressed in Fig. 2 as area (b). And
becomes low regardless of the level of
caused by project difficulty is occurred discontinuously.
Beyond a certain level of project difficulty,
outcome becomes low regardless of the level of Participation. This
relationship is expressed in Fig. 2 as area (b). And
remaining area (a) whose Project difficulty is lower than area (b) is subject to the level of Participation.

2.2. Method of demonstration by the hypothesis model
The effectiveness and ineffectiveness could be
demonstrated by confirming whether a result of
distribution of multi case studies could be explained by
the model (Fig. 2). For this, firstly we calculated Project difficulty, Participation and Outcome for each case study. Secondly, we plotted all the cases to the same plane as in

\[ \text{Participation (High)} \rightarrow \text{Outcome (High)} \]
\[ \text{Participation (Low)} \rightarrow \text{Outcome (Low)} \]

On the other hand, we assume ineffectiveness of EIA caused by project difficulty is occurred discontinuously.

\[ \text{IF project difficulty} > \text{a certain level} \]
\[ \text{Participation (Any)} \rightarrow \text{Outcome (Low)} \]

Beyond a certain level of project difficulty, outcome becomes low regardless of the level of Participation. This
relationship is expressed in Fig. 2 as area (b). And
remaining area (a) whose Project difficulty is lower than area (b) is subject to the level of Participation.

2.3. Case studies and data collection
For this study, 8 wind farm projects in Japan were
analyzed (Table 2). These are all the cases whereby EIA
ordinances of local governments had been applied,
excluding 3 cases in Fukushima prefecture because of
radioactive contamination cause by the nuclear accident.
For data collection, semi-structured interviews were
conducted with a variety of stakeholders, including: local
government officers, developers, environmental groups
and local residents, involved in each case study. In
addition, the planning documents, particularly EIA
documents were used to the analysis.
3. Calculation of Project difficulty

Table 3 shows definition of 7 parameters and 3-level evaluation criteria for each parameter. These were developed basically from literature reviews\(^6\)\(^{10}\) and interviews. The parameters can be divided into two categories: regulation of land use (1)-(4) and non regulatory factors (5)-(7).

The calculation result of Project difficulty is shown in Table 4. In this study, the score of Project difficulty was calculated by the sum total of all 7 parameters.

4. Calculation of Participation

Table 5 shows definition of 9 parameters and 3-level evaluation criteria for each parameters developed according to literature reviews\(^6\)\(^{10}\)\(^{12}\)\(^{13}\) and interviews. Each parameter is corresponding to either the four successive elements of participation (see Table 1).

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Table 5: Definition of the parameters for calculation of Participation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Lv.2</th>
<th>Lv.1</th>
<th>Lv.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>Widely publicized before scoping procedure</td>
<td>Publicized in a limited way before scoping procedure</td>
<td>Publicized at scoping procedure</td>
</tr>
<tr>
<td>Learning</td>
<td>Extensive measures for stakeholder’s learning were taken including multiple wind farm visit</td>
<td>Reasonable measures were taken (between Lv.2 and Lv.0)</td>
<td>Poor measures were taken and there were complaints from stakeholders</td>
</tr>
<tr>
<td>Adequacy</td>
<td>Available on the internet</td>
<td>Not available on the internet, but accessible in many place (prefecture, city and local level)</td>
<td>Not available on the internet, and accessibility was very limited.</td>
</tr>
<tr>
<td>Consult opportunity</td>
<td>Extensive opportunities were provided</td>
<td>Reasonable opportunities were provided</td>
<td>Opportunities were very limited</td>
</tr>
<tr>
<td>Sufficiency of reply</td>
<td>Multiple OR meaningful reply were observed</td>
<td>Single OR formal reply were observed</td>
<td>Comments were observed only on scoping document &amp; draft EIS</td>
</tr>
<tr>
<td>Plan Modification</td>
<td>Number/layout/capacity of turbine was modified OR no issues of concern</td>
<td>Operation control/route of access track was modified</td>
<td>No specific modification</td>
</tr>
<tr>
<td>Stakeholder’s satisfaction</td>
<td>Stakeholders were almost satisfied the modification OR no issues of concern</td>
<td>Stakeholders were partially satisfied the modification</td>
<td>Stakeholders were unsatisfied OR they did not recognized the modification at the time</td>
</tr>
</tbody>
</table>

* Adequacy focuses on three measure issues, noise, Raptors and landscape/visual. Evaluation points were selected by the issues of each case study.

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Table 6: Score of Participation

<table>
<thead>
<tr>
<th>Main issues of concern</th>
<th>Hyogo</th>
<th>Minami-awaji</th>
<th>Awaji-hokubu</th>
<th>Minenohara</th>
<th>Kamiyahagi</th>
<th>Nigorigo</th>
<th>Kasatori</th>
<th>Aoyama</th>
</tr>
</thead>
<tbody>
<tr>
<td>Representative Stakeholders (Opposition)</td>
<td>Golden Eagle, Mountain Hawk, (Bird-strike etc)</td>
<td>[In operation] Noise, Infrasound, Shadow flicker</td>
<td>Noise, Infrasound, Hawk migration</td>
<td>Hydrology, Mudslide, Golden Eagle, Landscape/Visual</td>
<td>No issues of concerns</td>
<td>Hawk migration, Raptors, Landscape/Visual, Animal</td>
<td>Mountain Hawk, [In operation] Noise, Hydrology</td>
<td>Mountain Hawk, Landscape/Visual, Noise, Wildlife nuisance</td>
</tr>
<tr>
<td>Timing</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Area</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Accessibility</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Learning</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Adequacy</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Consult</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Modification</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Participation</td>
<td>6</td>
<td>1</td>
<td>9</td>
<td>13</td>
<td>15</td>
<td>3</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

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Table 7: Definition of 4-level evaluation for Outcome

<table>
<thead>
<tr>
<th>Conflict before construction</th>
<th>Conflict after construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Arisen (Continued)</td>
</tr>
<tr>
<td>NA</td>
<td>Small-scale</td>
</tr>
<tr>
<td>Resolved</td>
<td>Lv.2</td>
</tr>
<tr>
<td>Continued</td>
<td>Lv.1</td>
</tr>
<tr>
<td>Aborted</td>
<td>Lv.0</td>
</tr>
</tbody>
</table>

The score of Participation (the sum total of all 9 parameters) is shown in Table 6. In addition, Table 6 shows the main issues of concerns and stakeholders.

5. Calculation of Outcome

Table 7 shows the definition of the 4-level evaluation for Outcome calculation. Outcome was evaluated mainly by two aspects: before construction and after construction, to consider the difference between the conflicts arisen by the concerns before construction and the conflicts resulting from actual impact after construction.
The score of Outcome is shown in Table 8. Only 1 out of 8 cases was evaluated as Lv.3, on the other hand, half of the cases were evaluated as Lv.0.

### 6. Demonstration by the multi case studies

The results of all 8 cases plotted as shown in Fig. 3.

Firstly, we focus on an area which Project difficulty is 5.5 and more. There are 4 cases in the area: Minenohara [5,5], Hyogo [6], Nigorigo [7,5] and Aoyama [9]. As shown in the following expression, all Outcome were low (Lv.0-1), regardless of Participation (e.g. Participation of Minenohara and Aoyama are equal or higher than Kasatori, both the Outcome are lower than Kasatori).

\[
\text{Project difficulty} \geq 5.5
\]

\[
\text{Participation} (3, 6, 11, 13) \rightarrow \text{Outcome} (\text{Lv.0 or 1})
\]

Secondly, we focus on remaining area whose Project difficulty is 4 or less. There are also 4 cases: Kamiyahagi [3], Kasatori [4], Awaji-hokubu [4] and Minami-awaji [2]. In the cases, the relationships between Participation and Outcome were summarized as the following expressions.

\[
\text{Participation} (15) \rightarrow \text{Outcome} (\text{Lv.3})
\]
\[
\text{Participation} (9, 11) \rightarrow \text{Outcome} (\text{Lv.2})
\]
\[
\text{Participation} (1) \rightarrow \text{Outcome} (\text{Lv.0})
\]

These expressions show that higher level of Participation is related with a higher level of Outcome.

From the above, 4 cases whose Project difficulty are 5.5 or more are corresponding to the area (b) in Fig.2 (i.e. ineffectiveness of EIA caused by project difficulty). And the remaining 4 cases whose Project difficulty are 4 or less corresponding to the area (a) in Fig.2 (i.e. effectiveness of public participation). Therefore, the all plot distribution could be explained by the hypothesis model (Fig. 2).

This result shows that the projects with a high level of Participation at the EIA stage are more likely to be successful in terms of conflict mitigation, beyond a certain Project difficulty (i.e. around 5), this is not necessarily the case. And more important, the result demonstrates there are two concrete challenges should be addressed in Japan. First one is enhancement of poor public participation (in cases of Minami-awaji). Second is strategic exclusion of sensitive site characteristics (in cases of Minenohara, Aoyama, Hyogo and Nigorigo) by introducing the strategic measure.

### 7. Discussion: which factor makes EIA ineffective as a conflict mitigation tool?

#### 7.1. The critical issues

We used a following subtraction to identify critical issues difficult to be solved at EIA stage among the multiple issues of concerns of ease case (see Table 6).

\[
[\text{Issues in area (b) cases}] - [\text{Issues in area (a) cases}]
\]

We assumed each 4 case in area (b) (Fig. 3) includes at least one critical issue. Therefore the cases include both “issues solved” and “issues not solved”. On the other hand, 4 cases in area (a) include only “issues solved.”

Thus, the subtraction identifies “issues not solved,” and this study defines these as the critical issues.

Table 9 shows the number of cases in which particular issues in area (b) / (a)

<table>
<thead>
<tr>
<th>Representitive</th>
<th>No. of cases in area (b)</th>
<th>No. of cases in area (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape/Visual</td>
<td>3/4 cases</td>
<td>0/4 cases</td>
</tr>
<tr>
<td>Hawk migration</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hydrology</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Golden Eagle</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Mountain Hawk</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Noise/Infrasound</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

This result shows that the projects with a high level of Participation at the EIA stage are more likely to be successful in terms of conflict mitigation, beyond a certain Project difficulty (i.e. around 5), this is not necessarily the case. And more important, the result demonstrates there are two concrete challenges should be addressed in Japan. First one is enhancement of poor public participation (in cases of Minami-awaji). Second is strategic exclusion of sensitive site characteristics (in cases of Minenohara, Aoyama, Hyogo and Nigorigo) by introducing the strategic measure.
7.2. Linkage site characteristics and emerged issues

Next we analyze causal linkages between the site characteristics and the emerged issues. For this, we made 7 assumptions of the linkages shown in Table 10.

Table 11 shows a result of the linkage analysis in a case of “Natural Parks Act → Landscape/Visual.” The matrix shows the number of cases that fall into each box, thus “Landscape/Visual” has emerged in 3 of 3 cases which were classified under land-use regulation as Natural Parks Act (i.e. Lv.1 - 2). On the other hand, the issue has not emerged in 5 of 5 cases which were not classified under this regulation (i.e. Lv.0 - 0.5).

Same analyses for each assumption were conducted and the result is summarized in Fig. 4. It indicates there are 4 relatively strong causal linkages between the site characteristics and the emerged issues, (1) Natural Parks Act (Ordinance) → landscape/visual (the issue has emerged in 3 of 3 cases applicable), (2) 10km grid habitat for Golden Eagle → Golden Eagle (2 of 3 cases), (3) 10km grid habitat for Mountain Hawk → Mountain Hawk (3 of 7 cases), (4) proximity to turbine (under 500m) → noise/infrasound (3 of 4 cases).

7.3. The specific barriers

At section 7.1, we discuss the critical issues which are difficult to be solved at the EIA stage, therefore it could be the direct cause of the unsuccessful. The result indicates Landscape/Visual and Golden Eagle are critical issues, and others are not critical (see lower half part of Fig. 4). And next section 7.2, we indicate the 4 relatively strong causal linkages between the site characteristics and the emerged issues (see upper half part of Fig. 4).

Therefore, the integration of the above two indicates following two specific barriers which make the EIA ineffective as a conflict mitigation tool: “designated areas regulated by Natural Parks Act” and “the disclosed 10km grid habitat for Golden Eagle.” These two should be excluded at an earlier stage than the EIA (i.e. strategic stage). On the other hand, other site characteristics were found as not critical barriers in this research, namely 10km grid habitat for mountain hawk eagle, protection forest, area of land use change and proximity to turbine.

8. Conclusion

This study aims to demonstrate both the effectiveness and ineffectiveness of EIA as a conflict mitigation tool.

By summing up the result of 8 case studies, it is shown that the projects with high level of public participation at EIA stage are more likely to be successful, however beyond a certain project difficulty, this is not necessarily the case. And the result also demonstrates two concrete challenges should be addressed in Japan: enhancement of poor public participation and strategic exclusion of sensitive site characteristics by introducing the strategic measure. To be more specific, the following two were identified as the sensitive characteristics: “land-use regulation by Natural Parks Act” and “the disclosed grid habitat for Golden Eagle.”

9. Limitation of the analysis methodology

This study showed the macro and quantitative analysis method to demonstrate empirically the effectiveness and challenges of EIA in Japan. However, the method didn’t consider the weight and cumulative effects of each parameter in the numeric scheme. These are the challenges for future research.
References


10) Ministry of Environment (2011) “Summary report of working group regarding basic concept on environmental impact assessments related to wind power generation facilities” (in Japanese)
